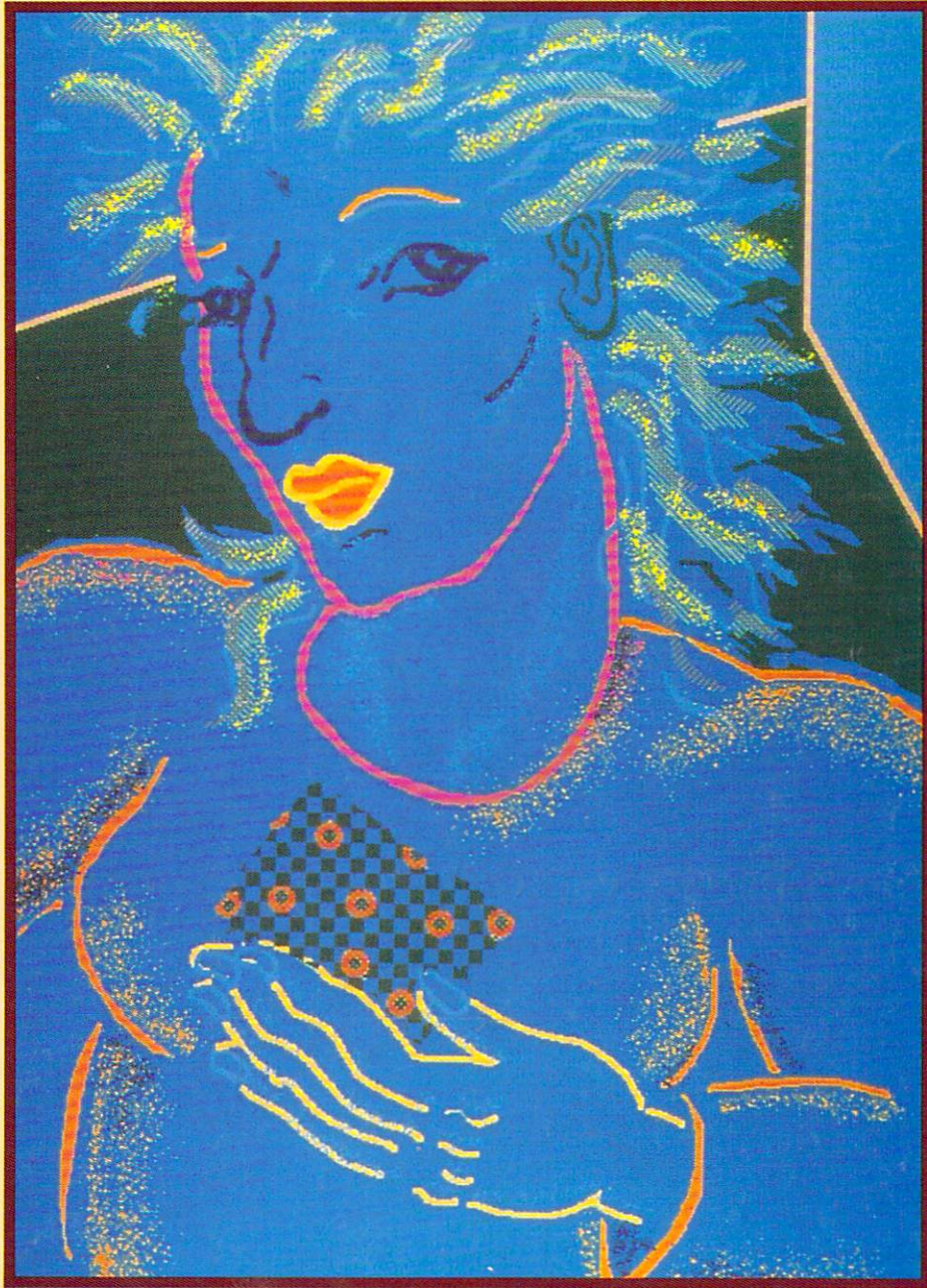


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APRIL 1991



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APRIL 1991

VOLUME 13 • NO. 4 • ISSUE 128

GAZETTE SUBSCRIBER EDITION

Special Coverage Follows Page 88

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Confessions of a Software Maniac G-6

DOUG BUCHANAN

Do you have an abnormal craving for software? Read how one person became a compulsive software consumer—helpless, spineless, capable of absolutely no self-control.

Writing Faster BASIC Programs G-10

ANTHONY CHANDLER

Learn programming tricks that make poky old BASIC get up and move.

DEPARTMENTS

64/128 View G-1

TOM NETSEL

There's important news for U.S. readers who buy Gazette from newsstands. Starting with the May issue of *COMPUTE*, Gazette will be available by subscription only.

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EDITORS

The Death Adder is tyrannizing the people of Yuria. Only three heroes have the powers to stop him in *Golden Axe*. Then discover what happens in a toy factory after dark in *Night Shift*. Check out *Bell Term*, an 80-column terminal program for the 64.

Feedback G-14

READERS

A New Zealand reader wants to know why an astronomy program doesn't work for him. How to find a lost SYS command, why certain graphics appear garbled, and what happened to all the great productivity programs.

COLUMNS

D'iversions G-18

FRED D'IGNAZIO

Have you ever imagined what computers would be like if you could live inside them? They could take you on such incredible journeys that you'd swear you were in another world.

Machine Language G-20

JIM BUTTERFIELD

The usual way to trap the interrupt is to divert the interrupt vector to a task. When the task is complete, it jumps to the interrupt routine. Learn more about preinterrupt and postinterrupt routines in this month's column.



JANICE R. FARY

Beginner BASIC G-22

LARRY COTTON

Generate telephone tones on the 64, poke them into frequency control registers, and then have them dial your telephone. Learn about multidimensional arrays while you're at it.

Programmer's Page G-24

RANDY THOMPSON

Did you know that the 64 doesn't care whether a number or a string is put between the parentheses in a PEEK function? Did you know that you can dimension nonarray variables? It's time for more weird facts about the 64.

TYPE-IN PROGRAMS

Stronghold G-25

DANNY ENGLISH

You must pilot your ship beneath a planet's surface and through a treacherous alien stronghold as you try to rescue survivors of a wrecked spaceship. Dodge lasers, crushers, force fields, and mysterious aliens in this arcade-style game for the 64.

AlarmCalc G-29

KEITH GROCE

Why buy a multiple-events timer when this program and your 64 can monitor up to five events, each with different starting and stopping times?

Word Find 3-D G-30

MILTON JOHNSON

Generate two- and three-dimensional word puzzles. Words you enter are printed horizontally, vertically, and diagonally—hidden within a matrix of random letters. They're in plain sight, but they're tough to find. The 3-D version is for experts only.

Hangman 128 G-34

DAVID WILLIAMS

This popular pencil-and-paper game has been adapted several times for computers, but *Hangman 128* provides a few sophisticated twists for 128 owners. Use its list of tough-to-guess words or supply your own.

Chaos G-36

ROBERT C. TRAIN

Order and organization can be produced out of chaos by the repetition of simple but constant rules. Test this theory to see what emerges from seemingly chaotic sequences with these programs for the 64 and 128.



64/128 VIEW

T O M N E T S E L

I have an important message for Commodore 64 and 128 owners who buy *COMPUTE* at the newsstand. This is the last issue in which the Gazette section will be packaged with *COMPUTE*.

Please note that this applies only to the U.S. newsstand edition of *COMPUTE*. The Gazette section will continue to be available with *COMPUTE* on newsstands in Canada and other countries.

This will not affect those who subscribe to the Gazette edition. Subscribers will still receive *COMPUTE* each month with its multiplatform coverage, including all the Gazette columns, features, type-in programs, and the latest information about the 8-bit Commodore market.

Despite the downturn in that market, we vow to continue serving our many loyal Gazette readers, most of whom already are subscribers. By targeting our coverage, we can better serve the needs of those readers. We know that this step will not be popular with those who buy the magazine at a newsstand, but it makes us more effective. So if you are not already a Gazette subscriber and you want to receive the best Commodore 64 and 128 information each month, subscribe now.

Fill out the subscription card found elsewhere in the magazine. Be sure to write *Gazette Edition* on the card and drop it in a mailbox. You can also subscribe by calling our subscription department; that toll-free number is (800) 727-6937. Tell the operator you want the Gazette edition, and you'll be billed \$12.97, which is a savings of 63 percent off the newsstand price.

While I hope everyone concerned will read this, I know we'll miss getting the word to some people. Since we can't contact those who buy the magazine from the newsstand, I hope some of you will post this information on your favorite BBS and share it with members of your user group.

Speaking of user groups, we'd like to hear from yours. We're in the process of updating our list of Commodore user groups. I know there have been some changes, what with new ones forming and old ones disbanding. We've sent letters to all the groups on our list, asking for address corrections and BBS information.

If your group does not return the letter we sent, we'll assume it has disbanded and drop it from our listing. Even if there have been no changes during the past year, you must return the letter to remain on our list. If we don't hear from you, your group will not be included in this year's listing. If

you are a member of a Commodore 64/128 user group and your group hasn't received a letter from *COMPUTE* Publications, contact us immediately with your group's name, mailing address, and BBS telephone number (if applicable). We want our list to include user groups in the U.S. and all other countries, and we want it to be as complete as possible.

User groups are an important resource for any Commodore owner, and if you don't belong to one, I strongly urge you to seek out one near you. Of course, if you don't know the name of your nearest group, check with Gazette. We'll print the complete list later this summer.

Due to a production error, the Gazette Readership Survey didn't appear in the issue when I announced it. Several of you felt strongly enough to write letters, voicing your opinions, likes, and dislikes about the magazine. Since the survey finally was printed in

the February edition, your responses have been pouring in.

Our receptionist, Cynthia Giles, takes time out from greeting visitors and answering calls at her busy switchboard to compile your responses. She's doing an outstanding job. Just as soon as the replies stop coming in and we get the figures tabulated, I'll report the findings here.

I'd like to thank all of you who took the time to fill out the survey, write letters, and add additional pages of information. Your views help shape the magazine, and since we share this information with interested software companies, they also help influence the type of software that reaches the Commodore market. □





New! CMD / Dr. Evil Products New! Lower Hard Drive Prices



HD Series™ Hard Drives

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The CMD HD series of hard drives for the Commodore 64 and 128 have been designed to provide the highest level of compatibility and performance. These drives incorporate the latest in SCSI technology with advanced circuit design to bring you the most features at an affordable price. CMD drives allow you to achieve the higher level of productivity you require to get the most from your existing software - today!

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- Up to 254 partitions in sizes ranging from 256 blocks to 65,280 blocks each.
- Built-in real time clock automatically time and date stamps all files.
- Compatible with Amiga, IBM and Macintosh systems for convenient upgrading.
- Connects easily to the serial bus, leaving ports open for use with cartridges, REU's and RAMLink.
- Supports all serial and JiffyDOS protocols, plus parallel interface for connection to RAMLink.
- Easy-to-use utilities allow backing up and copying files to and from 1541, 1571, or 1581 drives.
- Supports an unlimited number of true subdirectories which share all blocks within a partition.
- Built-in Q-Link software allows easy access to America's most popular 64/128 online service.
- External power supply avoids overheating and wear on computer power supply.
- Includes standard SCSI port and all utilities needed to expand the system (up to 4 Gigabytes).

HD-20 ~~\$599.95~~ NOW \$499.95 • HD-40 ~~\$799.95~~ NOW \$649.95
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More than a replacement for the deskTop, the gateWay offers a unique, streamlined approach to file management under GEOS. With a resizable Note Pad, proportional slider and fuel gauge, the gateWay makes it easier to get where you're going. In designing the gateWay, we took a good hard look at the deskTop to make sure that none of the functionality would be lost. Then we added feature after feature - capabilities that you, the serious GEOS user, have found lacking in the deskTop. At CMD, there's a lot more going on than powerful new hardware development - we're creating new ways to use it.

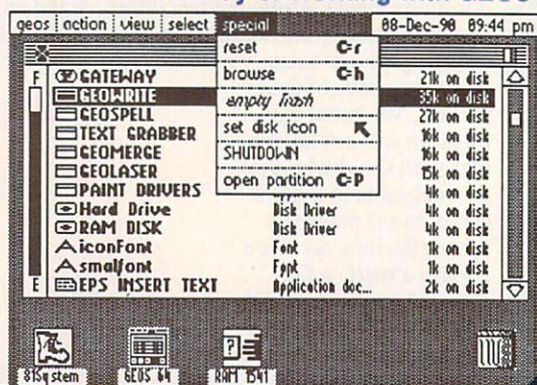
- Full three drive support, including auto-swapping for applications which will not allow use of drive C.
- Loadable disk drivers become memory resident and replaces the need for CONFIGURE.
- Full CMD device support for RAMLink, RAMDrive and HD hard drives allowing for partition sizes up to 16 Megabytes and Macintosh style folders.
- Supports using the CMD HD hard drive via parallel for faster hard drive access.
- RAM disk drivers allow use of as much available RAM as possible - no longer limiting you to a 1541 or 1571 sized RAM disk.
- Integrated Control Panel replaces the Preferences Manager and allows you to contour the gateWay to your choice of colors, screen pattern, printer driver and input driver.
- Task switching via our Switcher allows you to move instantly between two applications.
- An all new trash can structure which allows you to retrieve multiple files from the trash can.
- A proportional gadget for moving easily through the directory listing on the Note Pad.
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- A browse feature which helps in quickly locating files on the currently active device.

gateWay 64 \$29.95 • gateWay 128 \$29.95 • Both \$39.95 • Shipping: UPS Ground \$5.00

Note: The gateWay requires a Commodore 64 or 128, minimum of one disk drive, a mouse or joystick and GEOS 2.0 for operation.

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- Serial Cables - Quality 36" Commodore Serial Cables (6 pin DIN male to male) \$3.95
- Shipping (U.S.): LI. Connector \$5.00, Power Supply \$6.00, JiffyMON \$2.00, Serial Cables \$2.00

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SWIFTLink-232 gives you a true RS-232 port with the ability to communicate at speeds from 300 to 38,400 bps, plus true 1200 and 2400 bps using Hayes compatible modems. Experience the power of high speed modems and fast data transfers directly to other computers. SWIFTLink plugs easily into your computer's expansion (cartridge port) and provides an industry standard IBM-AT style serial port. As an added bonus, SWIFTLink comes complete with file transfer software (FTP) plus many popular shareware terminal programs such as Dexterm 128 and NovaTerm for the C-64. SWIFTLink is compatible with most hardware devices designed for the Commodore 64 and 128. Note: SWIFTLink serial Cable (DB-9 to DB-25) is required for use with most modems.

SWIFTLink-232 Cartridge \$39.95 SWIFTLink Cable \$9.95

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The STEREO SID Cartridge effectively adds a second complete SID chip to your Commodore 64 or 128, giving you a total of 6 separately controllable voices. SID SYMPHONY may be attached to your home stereo or most amplified speaker systems to provide you with whole new dimension in sound. Create your own stereo music using the Robert Stoerle's Stereo Editor (which we include free with *Computer's Enhanced SID Player* book), or just enjoy the many hundreds of available songs by using Mark A. Dickenson's Stereo Player software (included free with the SID SYMPHONY Cartridge). If you're interested in creating your own music files, be sure to get a copy of *Computer's Music System for the Commodore 128 and 64: The Enhanced SID Player*.

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RAMLink is a multi-purpose hardware interface designed to overcome the limitations of existing RAM expansion units (REU's). RAMLink delivers the performance and compatibility lacking in past REU's by incorporating CMD's proprietary RL-DOS and advanced features into a compact unit which allows most software to utilize Commodore 1700 series REU's, GEORAM, PPI's RAMDrive, and CMD's RAMCard as if it were a disk drive. Optional RAMCard installs internally and can be used alone or in combination with the storage of an external REU for a maximum capacity of 16 Megabytes.

- Supports Commodore 1700, 1764, 1750, Berkeley Softworks GEORAM and PPI's RAMDrive.
- Optional RAMCard allows RAMLink to be used as a RAM Disk with or without a separate REU. User Expandable from 1 Mb to 16 Mb using standard SIMMs.
- Pass-Thru connector allows use of cartridge port peripherals such as utility cartridges.
- Reset, Disable, Direct Access mode and SWAP functions are all standard features.
- RAM port provides power back-up to REU's.
- Parallel port provides ultra-fast data transfer when connected to CMD HD series hard drives.
- Includes separate power supply - optional battery available to protect against power failure.

RAMLink (w/out internal RAM)	\$149.95	RAMLink Battery back-up unit	\$24.95
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RAMCard w/ 1 Mb (if purchased separately)	\$149.95		

*Add \$90.00 per Mb for additional RAM up to 4Mb. Higher capacities - CALL. Prices and specifications subject to change without notice.

Shipping: US: \$10.50 (UPS), \$18.00 (2nd day), COD add \$4.00. Canada \$20.00.

Both RAMLink and RAMDrive Include RL-DOS

- Allows commercial software to access all available RAM as a high-performance RAM Disk.
- gateWay software for GEOS use available at no additional charge.
- RL-DOS performs up to 20 times faster than Commodore RAMDOS, up to 400 times faster than a stock 1541 and provides full DOS command compatibility.
- Up to 31 1541/1571/1581 emulation or Native mode partitions, plus true subdirectories.
- Includes built-in JiffyDOS Kernel for high-speed access to JiffyDOS equipped disk drives.
- Software for copying files (FCOPY) and complete disks (MCOPY) included.
- Many other features, including CMD's exclusive device number SWAP functions.

RAMLink or RAMDrive - Which one is right for you?

Both RAMLink and RAMDrive give Commodore users powerful features never before available in a RAM expander. RAMDrive is intended mainly for those who do not require the high RAM capacity of RAMLink (up to 16 Mb), RAMLink's Pass-Thru port or the parallel port for communicating with the CMD HD Series of hard drives. RAMDrive is an excellent choice for those who desire portability since the internal battery pack can keep the contents of RAMDrive intact for several days. RAMLink is the perfect choice for GEORAM owners who want the ability to use that device with programs other than GEOS. RAMLink has a built-in RAM Port for easy use with a GEORAM or Commodore REU. No matter which CMD RAM device you select, you'll benefit from the fantastic capabilities of a high speed RAM disk equipped with RL-DOS and the outstanding value of CMD support.

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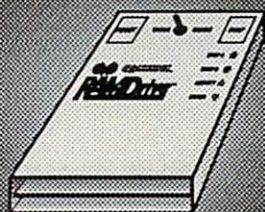
RAMDrive is a fresh new approach to RAM expansion for the Commodore 64 and 128. RAMDrive is a self contained battery backed cartridge with capacities of 512K, 1 Mb and 2 Mb. RAMDrive incorporates RL-DOS, an ultra-fast, easy-to-use operating system similar to the HD-DOS found in CMD HD Series hard drives. This DOS allows various types of partitioning along with compatibility and speed unsurpassed by previous RAM Expansion systems.

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- Reset, Disable and SWAP functions are all standard features.

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NEWS & NOTES

Another Bell Online

D & D Services announces *Bell-Term* (\$29.95) for the 64. This full-featured terminal program, distributed by Parsec (P.O. Box 111, Salem, Massachusetts 01970-0111) offers an 80-column mode for the 64, Y-Modem for batch transfers, and ARC.MOD to unarc files during downloads.

Other features include compatibility with the SwiftLink-232 cartridge for transfer speeds up to 19.2K baud, a split-screen chat mode, and a hi-res viewer/printer.

A Shadow of Evil

The Death Adder is tyrannizing the people of Yuria. Only three heroes have the powers to stop this ruthless tyrant and regain the throne in *Golden Axe* (\$34.95). Tyris-Flare, a beautiful and powerful amazon, is empowered by a special magic fire. Gilius-Thunderhead has an astonishing combination of lightning power and gymnastics. The Axe-Battler has sharpened his giant sword for battle. You must choose which challenger to send into battle against the Death Adder.

Choose your weapons wisely. You'll face Skeleton Swordsmen, Twin Brutes, and Lizard Women as you attempt to undo the evil Adder. The fate of the people of Yuria depends upon your skills. Weapons range from razor-sharp swords to curtains of fire. You can even joust with your foes from the back of a bizarrian, stolen from an unsaddled Adder ally. Force alone may not be the answer, however; remember, one dose of magic can wipe out an acre of evil.

Electronic Arts (1810 Gateway Drive, San Mateo, California 94404) distributes this arcade hit from Sega of America.



Amish Road

Amish Road by Michael Juliano of Davie, Florida, is this disk's Picture of the Month.

Welcome to "Gazette Gallery." Each month *Gazette Disk* features a collection of the best 64/128 artwork submitted by our readers. We pay \$50 for each piece of art we accept and an extra \$50 for the one selected as Picture of the Month. Send your original artwork to Gazette Gallery, COMPUTE Publications, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408.

Industrial Might & Logic

Lucasfilm Games (P.O. Box 10307, San Rafael, California 94912) announced that *Night Shift* (\$29.95) will soon be available for the 64 market. This arcade-style simulation is about a toy factory called Industrial Might & Logic. Perhaps not too surprisingly, it makes Star Wars and Indiana Jones toys.

Demand for the toys is so great that the company hires a night-shift worker who must contend with ever-increasing quotas, equipment failures, lawyers, lemmings, and a surly boss. Things do not go well for the hapless hireling as he tries to turn industrial waste into baby Darth Vader dolls, C3POs, R2D2s, Indiana Jones, and Zak McKrackens.

The game's intricate engineering of the toy machine and its intensity and pressure should appeal to a broad audience. □

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Confess

of a Software Maniac

My name is Doug and I'm a software addict. There, I've said it. I'm a compulsive software consumer—helpless, spineless, capable of absolutely no self-control. Now that it's out in the open, maybe others will recognize themselves and find solace in the knowledge that they're not alone.

A Tale of Woe

I became aware of my problem back in 1982, shortly after purchasing my first computer, a trusty old 16K Radio Shack Color Computer. Of course, way back then, there wasn't the magnitude of software that exists today and, consequently, not nearly the temptation. What was available loaded and saved by a painfully slow (and sometimes less-than-perfect) process—the cassette recorder.

Of course, there were those elegant Program-Paks. But overall, software development for home computers was still in its infancy. So I learned BASIC and wrote most of what I needed. Because BASIC (and my own limitations) restricted the complexity of my programs, I immediately became infatuated with each and every packaged program. Even at this early stage of my zeal for computers, I could already recognize the hunger building for more and more software.

August 1983 found me in possession of my first 64—it was love at first sight. Imagine, a computer with 64K, one on which you could actually edit a line! In retrospect, I guess that was the genesis of my journey into software madness. Like all obsessions, it began deceptively, creeping slowly like a thief in the night. First, a couple of games to generate envy among my com-

puter compatriots for my state-of-the-art machine—*BeachHead* to flaunt its sound and graphics, *Jumpman* to solidify their covetousness. Next, a good word processor so I could watch them *oooh* and *aaah* while I deftly manipulated, inserted, and deleted expanses of data. Each time I braved a software boutique, I found something that I needed just a little more than the package I'd bought the previous month. I was on a quest for the perfect program—the ultimate union of bits and bytes. A simple trip to the computer shop took on the aura of a spiritual pilgrimage.

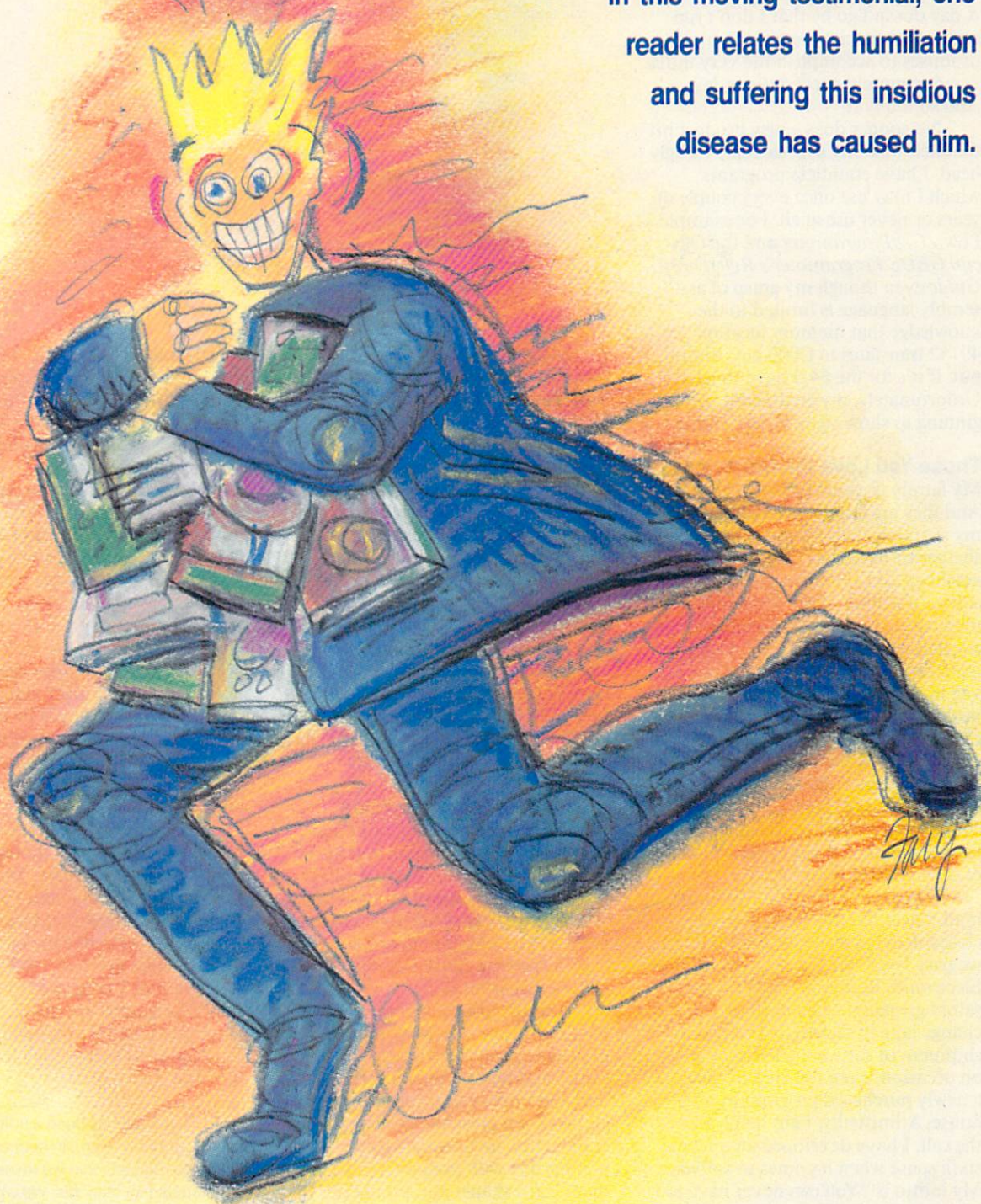
Before long, I was hanging out in department stores, cruising the aisles for any and all software. I would lurk for hours, waiting for stock crews to place the incoming packages on shelves. Whether or not I had a need for the software was inconsequential. Store clerks began eyeballing me suspiciously as if I were the carrier of some frightful affliction. Everywhere I looked I saw something I wanted. My passion for software became ravenous. I began frequenting user groups in the hopes of obtaining even outmoded, uninspired programs.

By 1984, everyone seemed to be writing programs for the 64. Software flowed in numbers I had never imagined possible. Software that would do anything and everything you could envision—and some things that you couldn't. I was hooked! As a member of the military community, my assignments took me to virtually every part of the U.S., Europe, and the Orient, affording me an anonymity which allowed me to keep my growing habit a secret. There were programs to do everything from personal finance to designing custom pinball games, and I had them all. Even though I'm not

D O U G B U C H A N A N

ions

Do you have a craving for software?
In this moving testimonial, one
reader relates the humiliation
and suffering this insidious
disease has caused him.



JANICE R. FARY

a "gamer," nor have I ever been, my library consists of virtually every 64 game from *Aztec* to *Zork*.

My productivityware embodies virtually every database, spreadsheet, word processor, assembler, and graphics program that's been written. With these, I'm capable of publishing anything from a modest birthday card to a comprehensive, unabridged version of *War and Peace* (in Russian with illustrations!), and thanks to a second drive and an REU, I still have enough memory to operate the traffic lights for the town of Malone, New York.

But am I satisfied? Certainly not. A day doesn't go by that I don't run across that special program that promises to accomplish the very thing I so desperately needed yesterday. And so, I buy it.

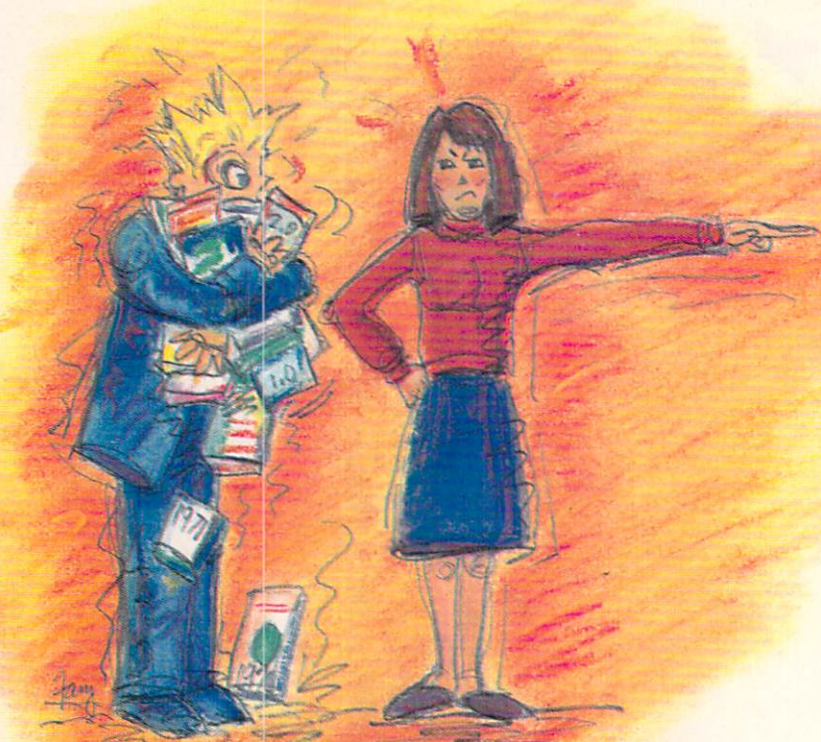
No sooner does a new product hit the shelf than my avarice rears its ugly head. I have countless programs which I may use once every couple of years or never use at all. For example, I own *GeoProgrammer* and the *Official GEOS Programmer's Reference Guide* even though my grasp of assembly language is limited to the knowledge that memory location 49152 translates to C000 hex. Simply put: If it's for the 64, I have to have it. Unfortunately, my credit cards are beginning to show signs of early aging.

Those You Love the Most

My family is aware of my weakness. And they are supportive of me, but my shame is their shame. They try to shelter me as best as they can. When a neighbor asks if that was me in the software section of the local department store, my wife will invariably reply that it was probably Mr. Collins from down the block, who looks a lot like me from behind. But they all suspect the truth. (Mr. Collins doesn't even own a computer.)

Not being the 64 buff that I am, my family can't relate to my problem. To the unversed, the 64 is just another computer. It's hard to imagine civilized humans in the nineties capable of such gnarled thinking.

Whenever I hint at a trip to the mall, I hear the murmurs behind closed doors. I sense the foreboding as we pass Toys "R" Us or approach the Electronics Boutique. I feel the accusatory grimaces when our base exchange here in Germany receives a shipment of software goodies. I have, on occasion, even resorted to sneaking a newly purchased program into the house. Admittedly, I am helpless to the call. I have developed an uncanny sixth sense when it comes to software. My motto is "You can never have too many databases."



My craving is not limited to commercial software. In addition to my endless supply of program disks (which I would estimate to be somewhere around 3200 programs), I also own virtually every copy of *COMPUTE!'s Gazette* dating from the early 1980s and a healthy storehouse of other 64 publications and books. Much to my wife's dismay, I steadfastly refuse to allow even the oldest of these to be thrown out. After all, who knows when I'll want to read the article "GEOS Update: One Year Old and Growing Fast" from the July 1987 issue of *Gazette*? I guard my publications. I'm even considering a vibration alarm next to my library to thwart any attempts at unauthorized entry.

A Creeping Social Menace

I recognize from limited volunteer work that my compulsion will never be totally eradicated. And so, I live from day to day, constantly fighting it. With the assistance and encouragement of my friends and family, I may have a sporting chance. But the lure is still overwhelming.

And it's just so easy for anyone to obtain software. Everywhere, I see preteens openly buying adventure games and businessmen procuring new and improved recordkeeping programs. Even preschoolers are not exempt. They are unremittingly bombarded with programs to help them learn shapes and numbers. Where will it end? People from every

social stratum fall victim daily. Software madness doesn't respect race, religion, national origin, or financial status. It can strike anyone wherever software is peddled, seducing even the thriftiest of consumers.

What can be done to combat this newest social malaise? Perhaps a Software Compulsives Anonymous (SCA) could be formed to provide group support. At SCA, people with similar problems would be able to discuss their addiction openly, secure in the knowledge that they weren't alone. Members could monitor each other's progress using a buddy system. A 24-hour SCA hotline could be instituted for those whose self-imposed restraints are constantly tested by names like Electronic Arts, Abacus, and Mindscape.

I have a long way to go to recovery. But a journey of a thousand miles begins with a single step. Yes, I'm a software compulsive, but I've met the enemy and I know that I can lick this in time. If you're like me or know someone like me, I counsel you to remember that 1 program is too much and 50 programs are not enough. Once you give in, you open the floodgate. So hang tough and fight the urge. Just say *No!* □

Doug Buchanan has been a software "user" for many years. In deference to his family, he requests that we reveal nothing more about him than this. We wish Doug success in controlling his habit.

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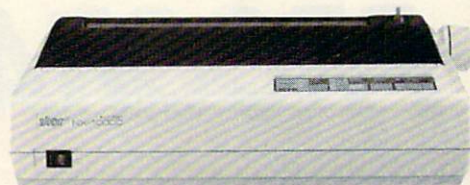
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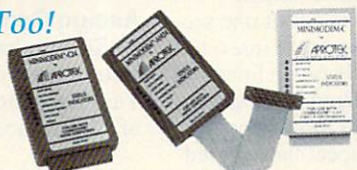
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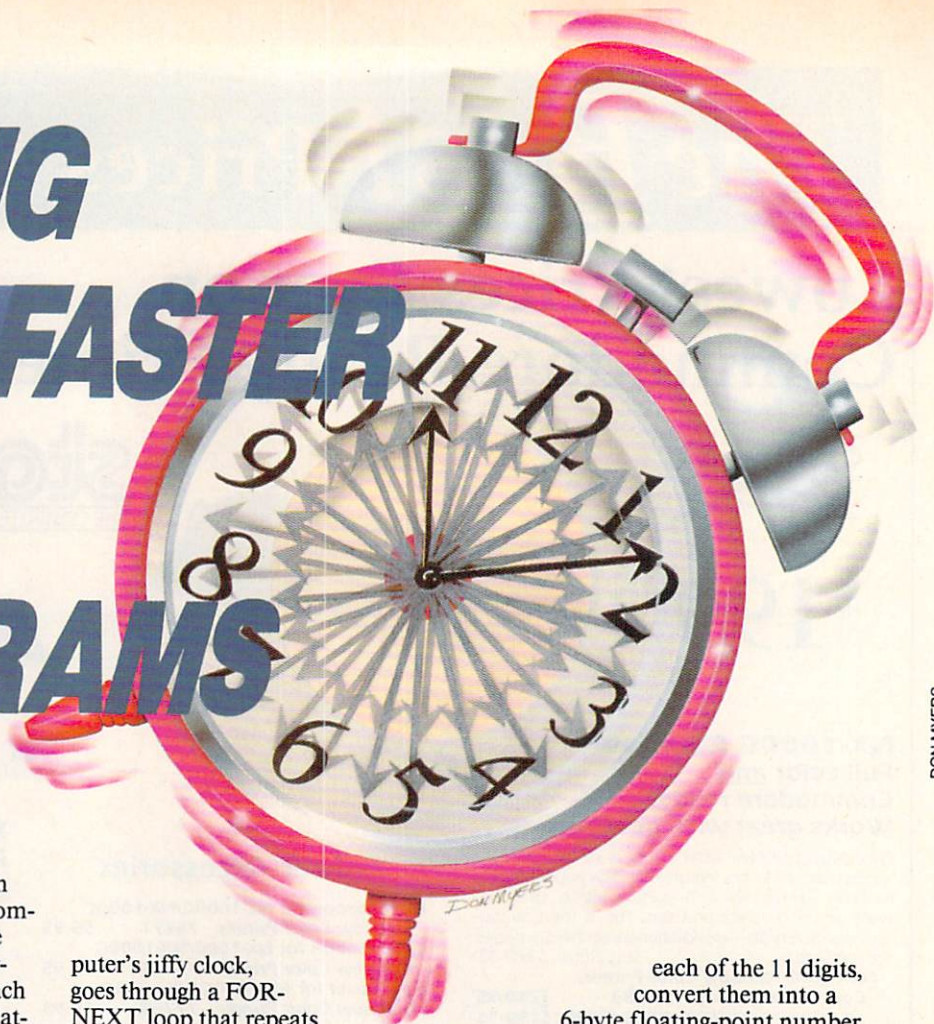
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WRITING FASTER BASIC PROGRAMS



DON MYERS

Programs that are written in BASIC often run slowly compared to machine language programs. The BASIC interpreter has to spend time reading each line of the program and then translating it into the correct set of machine language codes for the computer to perform the instruction. If instructions have to be repeated many times (for example, inside a FOR-NEXT loop), the time delays add up and really become noticeable.

In this article, we'll discuss how you can write or even rewrite BASIC programs to make them run faster. To see how much time the different instructions take, enter the following simple timing program.

```
10 REM TIMETEST
100 A=1:B=2:C=3:D=4:E=5:F=6:G=7:H=8
110 I=9:J=10:K=11:L=12:M=13:N=14:O=15
120 P=16:Q=17:R=18:S=19:T=20:U=21
130 V=22:W=23:X=24:Y=25:Y%=26
140 Z=.00134796247
160 TS=TI
200 FOR I=1 TO 1000
300 NEXT
310 TF=TI:TT=INT((TF-TS)/6)/10
320 PRINT "TIME WAS";TT-1;"SECONDS"
330 LIST 200-300
```

After you've set up some variables, this test program reads the com-

puter's jiffy clock, goes through a FOR-NEXT loop that repeats itself a thousand times, and reads the jiffy clock again. The empty loop, without any instructions inside, takes about one second to run. There's room to insert additional instructions between lines 200 and 300, and the difference between the two clock readings minus one is the time it takes to repeat the inserted instruction 1000 times, or the time in thousandths of a second (milliseconds) to execute the instruction once.

This program uses the 64's TI function to read the start and finish times. For other models of computer, a different command may be required to access the internal clock.

Run the program, and you'll see the final message giving a time of 0 seconds. Now try adding a line inside the loop.

```
210 V=V+.00134796247
```

It takes 46.3 seconds to execute this statement 1000 times. (Your time may vary slightly.) Each time BASIC encounters the number in line 210, it has to read the decimal point and

each of the 11 digits, convert them into a 6-byte floating-point number (+1.34796247 E-3), and add that number to the value assigned to V.

Assign Constants to Variables

BASIC can handle variables much faster than it can handle numbers. This is the most important timesaver of all. Replace line 210 with

```
210 V=V+Z
```

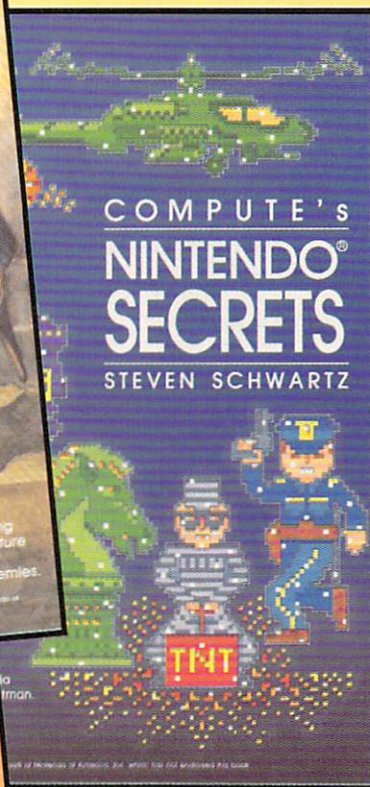
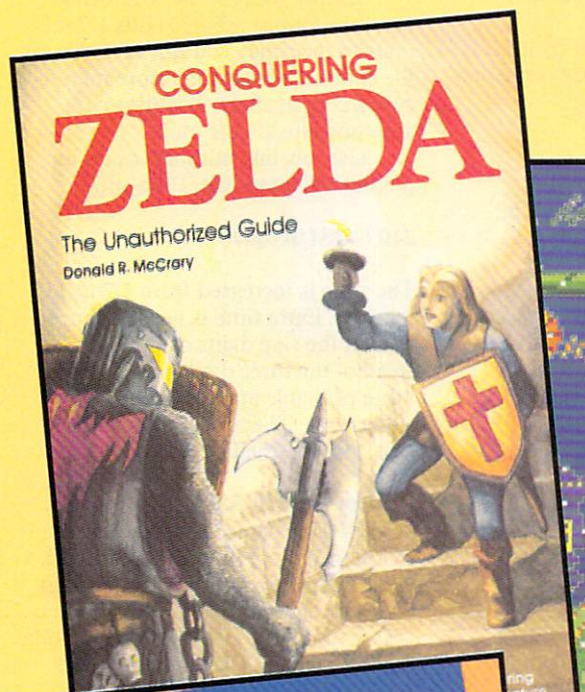
Because the variable Z has already been set to a value of .00134796247 in line 140, this new line performs the same operation. Running the program shows a time of 5.1 seconds—nine times faster.

When the variable Z was assigned in line 140, BASIC converted the value into a 6-byte floating-point number and stored it in a list of variables. Each time BASIC reads line 210, it has only to read one character, Z, instead of a decimal point and 11 digits. Having read Z, it then looks up the floating-point value directly from the list of variables. This avoids having to perform the cumbersome floating-point conversion 1000 times. ▸

ANTHONY CHANDLER

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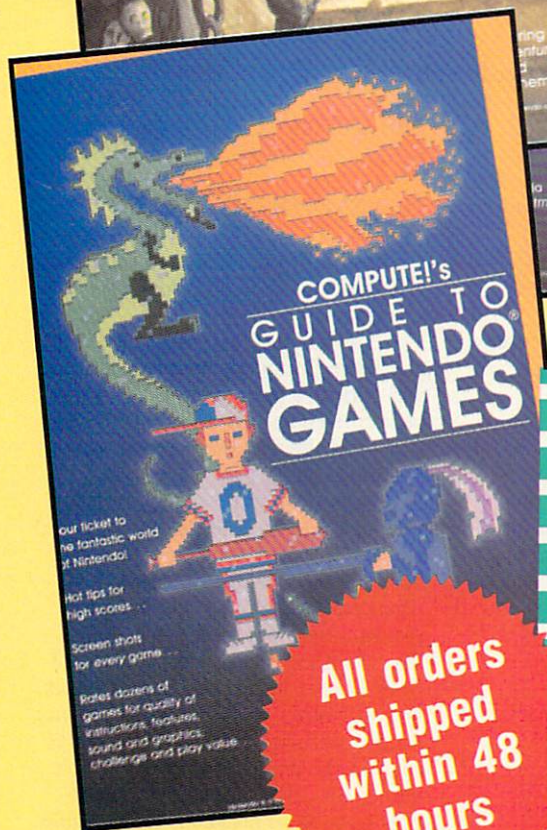
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Define Frequently Used Variables Early

The program will run even faster if you move the statement assigning a value to the Z variable from line 140 to an earlier point in the program, say line 90. When BASIC reads a variable name such as Z for the first time, it writes the name and its assigned value in a list. (A similar list is built up for string variables such as W\$).

The first variable encountered in the program is entered at the top of the list, followed by the next one, and so on. Z is the 27th variable in the list. When it appears in line 210, BASIC has to search through the other 26 variables until it finds the right one. Obviously, it's quicker to find a variable near the top of the list than it is to find one at the bottom. To test this, let's enter a new line.

```
90 Z=.00134796247
```

When the program is run, the variable Z will now be placed at the top of the list. The runtime will be reduced from 5.1 seconds to 4.1 seconds, the difference being the time taken by BASIC to search through the other 26 variable names in the list. Line 140 is now unnecessary, but its presence does not alter Z's position in the variable list.

Repeat the process with variable V by entering

```
95 V=22
```

This puts variable V in second place on the list. When the program is run, you'll find that the time is shortened to 2.7 seconds because both variables are now found quickly.

Omit the Count Variable from NEXT Statements

Whenever you have a single FOR loop, terminate it with the word NEXT instead of specifying the variable name, such as NEXT I. This saves time because BASIC does not bother to check that the count variable, I, is the same as that in the last FOR statement. To see how much difference this makes, change line 300 to

```
300 NEXT I
```

Running the program will show an increase in time from 2.7 seconds to 3.3 seconds.

If there's an inner loop nested inside an outer loop, it isn't always essential to specify the count variable. Enter the following lines, and note the differences in running times.

```
210 FOR J = 1 to 5
300 NEXT J:NEXT I
```

With the count variable given for each loop, the time is 12.1 seconds. Line 300 can also be written this way:

```
300 NEXT J,I
```

This cuts the running time by only 0.1 seconds. Now change line 300 again and notice the change.

```
300 NEXT:NEXT
```

At 8.3 seconds, this is decidedly faster than the alternatives NEXT J,I and NEXT J:NEXT I.

Multiplying a number by itself is faster than squaring it by exponentiation.

```
210 D=C*C
300 NEXT
```

This takes 3.8 seconds, but watch what happens when you square C.

```
210 D=C↑B
```

The processing time increases to 53.1 seconds.

Multiplying is faster than dividing.

```
210 A=B*C
```

This takes 3.5 seconds.

```
210 A=B/C
```

Now the computation takes 4.9 seconds. It's faster to multiply by 0.1 than it is to divide by 10.

Adding the same number twice is faster than multiplying by 2.

```
210 C=A+A
```

Adding the variables that represent 1 + 1 takes 2.4 seconds.

```
210 C=B*A
```

Multiplying the variables that represent 2 × 1 takes 3.5 seconds.

```
210 C=2*A
```

Using the number instead of a variable takes even longer: 3.8 seconds. Integer variables are faster than the integer function. If the number involved is less than 32,768, defining an integer variable takes less time than calculating an integer.

```
210 Y%=A
```

This takes 2.8 seconds.

```
210 Y=INT(A)
```

Writing it this way increases the time to 3.6 seconds.

Avoid Subroutines Within Loops

When you have a loop that repeats many times, try to avoid having a GOSUB inside the loop. Try the effect of adding the following statements.

```
400 RETURN
10000 RETURN
```

Then change line 210.

```
210 GOSUB 400
```

Simply going to and returning from the empty sub 400 adds 1.7 seconds to the time. You can save this (at the expense of using up more memory) by copying the subroutine's instructions inside the loop.

Use low line numbers as far as possible. Change line 210 again.

```
210 GOSUB 10000
```

The time is increased from 1.7 to 2.0 seconds. Extra time is needed simply to read the five digits of 10,000 instead of the three digits in 400. The same principle applies to GOTO statements. The fewer digits in the line number, the faster the program.

Remove REM Statements

While REM statements make it easier to follow a program and understand what's happening, programs will run faster if you eliminate them—particularly within loops. If you must include REM statements, keep them short.

```
210 REM
```

This adds 0.3 seconds to the loop without line 210.

```
210 REM THIS IS A TEST
```

Adding additional words to the REM statement doubles the time to 0.6 seconds.

You can use this test program to check the timing of other instructions and compare their speeds. You may be surprised at how different expressions and the way they're used affect running time.

When you write a program, do it in your usual way. Get all the bugs out and make sure it's running properly before you try to improve its speed. Then, take a look at it and see where you can make speed improvements. Start with the most-used and longest FOR-NEXT loops, replace constants with variables, and revise expressions, putting definitions of these variables early in the program. Reuse variable names for different purposes wherever possible. This keeps the variable list short and results in faster access times and more memory space. □

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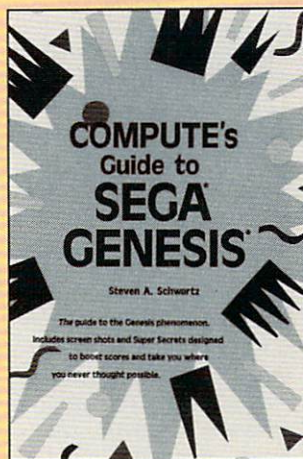


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FEEDBACK

E D I T O R S A N D R E A D E R S

A Note from New Zealand

I enjoy your magazine, but it seems to cater more for the 64 than the 128, which is a much more versatile machine. I'm not really into games, so I would appreciate more utilities. More information on using the 128 as a controller of household functions would be of interest, as would a program that would let my printer print sideways.

Incidentally, I was struck with some problems with *Stars II* (COMPUTE!'s Gazette, August 1989). There was no way to produce a sky as seen from the southern hemisphere. Why is this?

NOEL RICKETTS
AUCKLAND, NEW ZEALAND

We try to supply a variety of programs for both computers in each issue, but we rely on submissions from our readers. Since we're always eager to publish good utility programs for both the 128 and the 64, we encourage programmers to send such programs to our submissions reviewer. Programmers have asked about resubmitting programs that we may have rejected in the past. If the program is fairly bug free and you feel it has merit, submit it again. It may have been rejected simply because it was similar to a program we had recently published. For example, in November 1990 we ran Right/Side, a printer program that does just what you ask. Therefore, if someone sends us a similar program tomorrow, chances are it won't get published. If a program is too large, that's also a strike against it—although we may offer it as a bonus program on disk only. Stars II had that problem. By including all the code needed to produce views in the northern skies, the program would've been much too large to offer as a type-in.

In response to your question about Stars II, author Robert A. Mulford says, "The east, south, and west views are calculated by the same subroutine. A north view would have required a separate one.

Since the planets are never seen in the northern sky by people in the northern hemisphere, I decided not to include a northern view to save a few lines of code." We apologize for the inconvenience this may have caused readers who live south of the equator; a new version of the program that should solve that problem is in the works.

Transformer Needed

My BMC monitor, model BM 919U, died recently, and a service technician told me it needs a new high-voltage flyback transformer. The schematic diagram with the monitor gives no information to help him in ordering a new one, and the company that sold me the monitor no longer handles computer hardware. Can anyone help me locate a replacement for this transformer?

KARL HALTNER
507 SMITHSON AVE.
ERIE, PA 16511

How about it, readers?

Anything but Games?

I have a 128 with a 1571 and an MPS-803 printer. I have noticed that Commodore software seems to be leaning more to games than to nongame programs. Do software companies plan on ignoring us nongame users? I would like to see more productivity programs such as *Fleet Systems*. Maybe they should survey us Commodore owners and ask us what we'd like to see in new releases.

ROLAND A. DUPONT
SUSANVILLE, CA

New software releases for the 64 or 128 have slowed dramatically, but software companies are still interested in what the market wants. That's one of the reasons why we published the readership survey in the February issue. In addition to helping us produce the kind of magazine you want, we share the results with software companies to help them in their marketing decisions.

So if you haven't responded yet, it's not too late to send it in and let your voice be heard. We'll also publish the survey results as soon as they are tabulated.

Some European software companies are introducing some of their hits to the U.S. market. One program that may interest you is from England's Database Software. Mini Office II is an integrated package for the 64 that contains a word processor, spreadsheet, database, graphics program, terminal program, and label maker—all in one package. We'll print a review of this product in an upcoming issue.

Fool Your 1571

I have a 128 with a 1571 disk drive. I have several programs that specify a 64 and a 1541 disk drive that are giving me problems. Is there some way I can fool the drive into thinking it's a 1541?

ROY N. KELLEY
HAMILTON, OH

After you've turned on your monitor and 1571, turn on your 128 while pressing the Commodore key. This boots the 128 in 64 mode, and it makes the 1571 think it's a 1541. Give this a try and see if it helps.

An Index and Show Schedule

I would like to see a yearly Gazette index in either the December or January issue. It would be helpful when looking for information on various subjects. Also, a column on future shows and seminars might be helpful. If it were published in a column, it would be quick and easy to review. That would give us a little advance notice, and I could possibly make plans to attend. I might have even made plans to vacation in Las Vegas to coincide with the Consumer Electronics Show.

FRED BLANCK
LANSING, MI

We do publish a Gazette Index on disk each year. It not only covers the year just past, but all the previous

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As for shows of interest to Commodore owners, we'd be happy to print such a listing for national or larger regional shows if we get the information in time. Our production deadlines require us to have the information three to four months prior to the event.

As for shows such as COMDEX or the Consumer Electronics Show, they are trade shows not open to the public. Entry is restricted to exhibitors, people in the industry, and the press, although there is some talk of opening such shows on at least one day to the public.

Missing SYS

I have a problem with one of my 64 programs. I have forgotten the SYS address needed to run it. How can I find it?

ELIUD CAMPOS RIVERA
ARECIBO, PUERTO RICO

The problem is simple to state, but the solution could be difficult. Begin, though, by assuming that the machine code loads to one of the common locations. They are the

cassette buffer at address 828 (\$33C), the upper 8K of BASIC RAM at 32768 (\$8000), the upper 4K of BASIC RAM at 36864 (\$9000), and the 4K RAM window at 49152 (\$C000). The most likely spot is the last listed. Simply load the machine code with a ,8,1 and SYS to these addresses. The computer may lock up, requiring you to turn it off and on again.

If none of these addresses produces results, either of two things are likely: The program doesn't load to that address, or the starting address of the load is not the starting address of the actual program.

In the first case, the disk itself must be examined for the load address. Several programs will do this for you, including MetaBASIC (COMPUTE!'s Gazette, February 1987). The alternative to running a load-address program is to use a disk editor to examine the directory for the starting track and sector of the program. You can then go to that sector and read the load address from the third and fourth bytes, where it will be in low-byte, high-byte order.

If the executable address isn't the load address, you'll need to examine the code with an assembler

program (once the location of the code has been determined). Sometimes the code resides beneath BASIC or Kernal ROM, and you'll need a separate machine code program to remove the ROM to run it. Less often, the code has a specific load address known only to a boot routine which, for whatever reason, you may not have. Occasionally, the program may make use of the CBM80 cartridge test during initialization. If so, a cold-start call may start the program. You can call the cold-start routine with a SYS 64738. Happy hunting!

Messed-Up Graphics

In 64 mode, I'm having problems with graphics in a lot of games on my 128. When I run a newer game, the graphics never show up, but a mess of characters fill the screen. The game works; the sound comes up; the demo still works. It's not the drive or the disk. Older games still work, though.

JASON FRITZ
LITTLETON, CO

From your description of the problem, it sounds as though your video interface chip (VIC) isn't creating a bitmapped screen. The "mess of characters" that you refer to are

symptomatic of a bad VIC because color information for bitmaps is stored in the same memory location as normal text. If the software thinks it's supplying color information to a bitmap, and the VIC actually hasn't left text mode, you wind up with a bunch of characters that make no sense. Go to 128 mode and type in the following program. When the program is run with a working VIC and a 40-column display, you will see a white spiral emerging from the center of a dark blue background. But with a bad VIC, the screen will instead be filled with strange characters.

```
10 POKE 53280,6:POKE 53281,6
20 GRAPHIC 1,1
30 COLOR 1,2
40 LX=160:LY=100
50 FOR X=0 TO 400
60 PX=160+X/4*COS(X/8):PY=
  100+X/4*SIN(X/8)
70 DRAW 1,LX,LY TO PX,PY
80 LX=PX:LY=PY
90 NEXT
100 GRAPHIC 0
```

To check the video interface chip in a 64, type in and run Chaos in the Program section of this issue. ☐

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D'IVERSIONS

F R E D D ' I G N A Z I O

Have you ever imagined what computers would be like if you lived inside them like rooms? You know what I'm talking about if you've been to a game arcade recently. It used to be that to play a game you'd walk up to a box, pop in a quarter or two, and stand in front of the box watching the display screen and pumping some buttons.

That's all changed. Now you don't walk up to a box, you climb inside! And when you do, you leave the game arcade behind, and you enter another world.

Recently my son, Eric, and I were in a shopping mall in Cheyenne, Wyoming. In the center of the mall was a vehicle that looked like a cross between a passenger van and an icebox. On closer inspection we discovered that this *box* was indeed a vehicle—a vehicle of the senses and the imagination, a vehicle without wheels.

Inside the vehicle were eight rows of seats, all equipped with shoulder harnesses. In the front was a projection screen that covered the entire wall. Spread evenly around the walls were surround-sound speakers. The motto of this vehicle was displayed on a sign hung over the narrow doorway. It read: "Swear You Are There!"

Eric and I were curious. We each paid our two-dollar entry fee and crawled into the vehicle. Once inside, we found two seats together and strapped ourselves in. We noticed that our armrests had handholds. All this seemed a little bit silly. After all, this vehicle had no wheels! It was stuck in the middle of a shopping mall. Where could we be going?

Suddenly the lights went out. We were in absolute darkness. Then the front screen lit up. It seemed to fill the room. We heard grinding noises, metallic scraping. Our seats began to rock.

We were on a roller coaster! Slowly, swaying side to side, the roller coaster left the station and began climbing a monster hill. It picked up speed. The people beside us began to moan in fear and anticipation. I found

myself clutching the handgrips as my seat tilted farther and farther back. Were we going straight up?

Inch by inch, foot by foot, we climbed that terrible hill. Finally we arced over the top and fell, down, down the other side, rapidly gaining speed. Now our seats were tilted forward. I felt like I was going to fall on my nose! Thank goodness for the security of my shoulder harness!



The wind whined past my ears. People screamed. I heard myself screaming. Beside me Eric sat, gritting his teeth, his eyes wide, a huge smile on his lips. "Awesome!" he said.

The roller-coaster box in Cheyenne was actually a NASA space-flight simulator that had been acquired secondhand by an entertainment company. The company converted the simulator into a ride that tours shopping malls around the far west. Eric and I went on the roller-coaster ride, but that was only one of the many "virtual experiences" that the simulator offered. At different times of the day you could ride dangerous white-water rapids, ski downhill, or jump out of an airplane with a dinky parachute in the middle of a typhoon. By playing a movie on the front

screen, immersing you in surround-sound, and tilting the box up to 45 degrees in any direction, the simulator could make your body and your imagination swear you were there. *There* was anywhere the game designer wanted to you be.

These days you hear how computers are getting smaller and smaller—so small, in fact, that pretty soon you won't even be able to see them. We all have visions of carrying around powerful laptop computers, pocket computers, and even wrist-top computers and playing games on increasingly powerful Game Boy-style arcade machines that fit into the palm of our hands.

Now take a second and turn this idea upside down. What if we don't end up carrying computers around? What if, instead, we go inside computer *rooms* where the entire room is a giant computer that can synthesize reality on walls covered with video wallpaper and surround-sound speakers that immerse us in a pine forest, a stormy sea, or a busy city street?

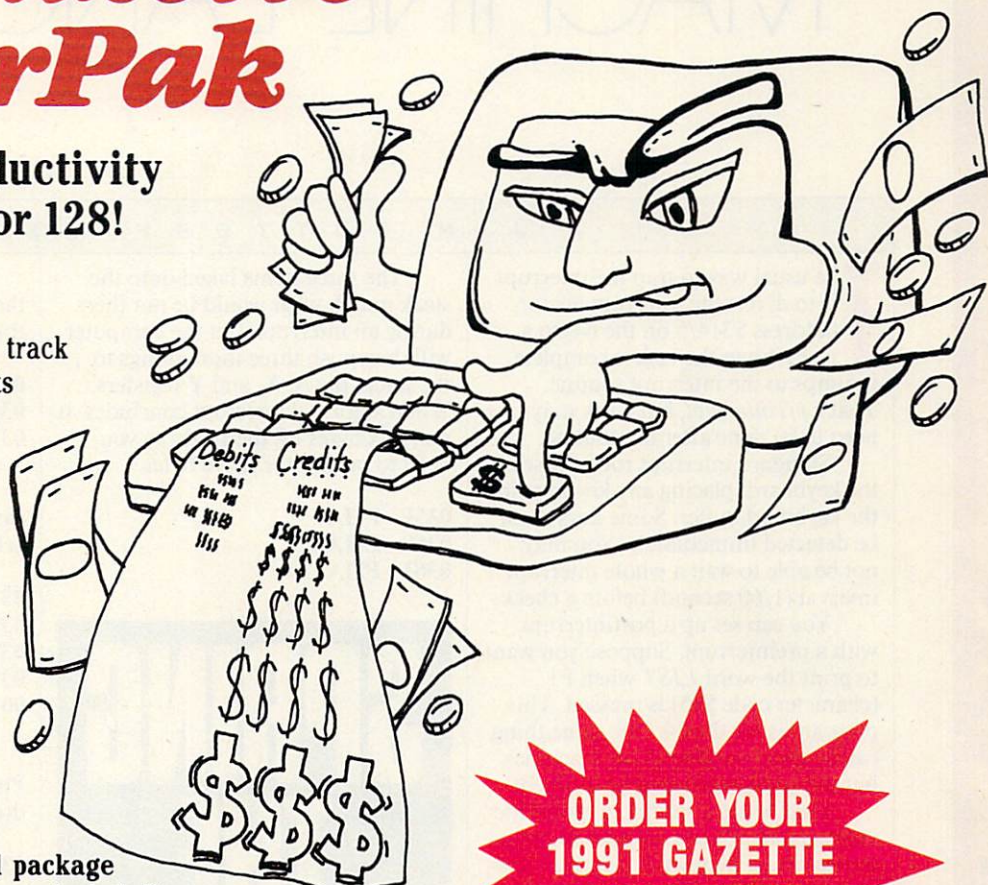
Computer *rooms* like the NASA simulator in the Cheyenne shopping mall aren't just science fiction. They're reality. The new theme parks now on the drawing boards for the twenty-first century will all have virtual reality environments controlled by multimedia computers.

Classrooms, too, are under construction where the walls become the world. Students can watch wall-sized video projections of computer graphics and laser video and hear powerful micro-speakers recreate a moon launch, a civil rights march, a nuclear explosion, or a simulated voyage inside a DNA molecule. If your entire room is a computer vehicle, then you're inside a *Starship Enterprise* that can take you, via your senses and your imagination, to any place or any time. Classroom learning would no longer be a dry and dreary affair. Instead, you'd be an explorer, an eyewitness reporter, an adventurer. What you'd learn would seem so real, you'd swear you were there! □

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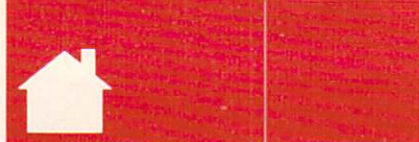
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MACHINE LANGUAGE

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The usual way to trap the interrupt is to divert the interrupt vector (address \$314/5 on the 64) to a task. When the task is complete, it jumps to the interrupt routine. That's *preinterrupt*, but work may need to be done after the routine.

Standard interrupt routines scan the keyboard, placing any keypress in the keyboard buffer. Some keys must be detected immediately. You may not be able to wait a whole interrupt interval (1/60 second) before a check.

You can set up a postinterrupt with a preinterrupt. Suppose you want to print the word *LIST* when F1 (character code \$85) is pressed. This program is for the 64. The same thing can be done on other 8-bit machines, but the addresses might be different.

First, write a routine to point the interrupt vector to your special preinterrupt code; then write a similar program to restore the interrupt vector, disabling the program.

```
033C LDA #$56
033E LDX #$03
0340 SEI
0341 STA $0314
0344 STX $0315
0347 CLI
0348 RTS
0349 LDA #$31
034B LDX #$EA
034D SEI
034E STA $0314
0351 STX $0315
0354 CLI
0355 RTS
```

Next comes your preinterrupt program that sets up a postinterrupt. You'll fake an interrupt event on the stack to make the computer think it's executing a normal return from an interrupt: the postinterrupt program at \$0365 and a fake status register entry.

```
0356 LDA #$03
0358 PHA
0359 LDA #$65
035B PHA
035C LDA #$00
035E PHA
```

The three items faked onto the stack match what would be put there during an interrupt, but the computer will then push three more things to the stack: the A, X, and Y registers. When a normal interrupt concludes, it pulls six bytes off the stack, so you need to push three more bytes.

```
035F PHA
0360 PHA
0361 PHA
```

SPRING THE TRAP AFTER THE QUARRY RUNS

Now give control to the interrupt sequences (at \$EA31). When complete, that code will perform an interrupt-return sequence. Instead of returning to the interrupt point, the program will be switched to address \$0365.

```
0362 JMP $EA31
```

The code at \$0365 will be run postinterrupt. If the buffer count (held in address \$C6) isn't exactly one character, skip to the exit at \$0380.

```
0365 LDX $C6
0367 BEQ $0380
0369 DEX
036A BNE $0380
```

If the character that's detected in the keyboard buffer isn't F1, skip to the exit.

```
036C LDA $0277
036F CMP #$85
0371 BNE $0380
```

The X register has been set to 0 in earlier code, so we can copy the characters *LIST* into the keyboard buffer.

```
0373 LDA $0383,X
0376 STA $0277,X
0379 INX
037A CPX #$04
037C BNE $0373
```

The X register now contains a 4. Put this into the buffer count at address \$C6.

```
037E STX $C6
```

Now go to the ROM code in the 64 that will do the *real* interrupt exit and include the characters *LIST*.

```
0380 JMP $EA81
0383 4C 49 53 54 ; ASCII "LIST"
```

Here's the whole routine placed in a BASIC program.

```
10 REM POSTINTERRUPT DEMO
20 REM JIM BUTTERFIELD
30 DATA 169,86,162,3,120,141
40 DATA 20,3,142,21,3,88,96
50 DATA 169,49,162,234,120,141
60 DATA 20,3,142,21,3,88,96
70 DATA 169,3,72,169,101,72
80 DATA 169,0,72,72,72,72,76
90 DATA 49,234,166,198,240,23
100 DATA 202,208,20,173,119,2
110 DATA 201,133,208,13,189
120 DATA 131,3,157,119,2,232
130 DATA 224,4,208,245,134,198
140 DATA 76,129,234,76,73,83
150 DATA 84
200 FOR J=828 TO 902
210 READ X
220 T=T+X
230 POKE J,X
240 NEXT J
250 IF T<>8211 THEN STOP
300 PRINT "TO ENERGIZE F1:"
310 PRINT "SYS 828"
320 PRINT "TO RESTORE:"
330 PRINT "SYS 841" □
```




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BEGINNER BASIC

L A R R Y C O T T O N

Let's take a new look at how to handle BASIC's multidimensional arrays. As you may recall from an earlier column, an array is a flexible way of expressing and manipulating variables. I compared multidimensional arrays to pigeonholes, where numbers which represent colors or names or musical pitches can be stored, ready to use.

We'll begin a program with which you'll be able to point to a name in a directory of up to 22 names and then press Return to get the computer to actually dial your telephone for you! (The program works only with telephones that generate the 12 standard tone-dialing frequency pairs, such as AT & T's touch-tone.)

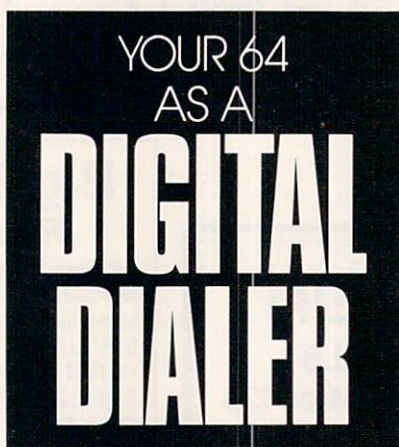
On a touch-tone telephone's keypad, each number key, when pressed, generates two accurately controlled tones. We can generate those same tones on the 64 by poking musical pitch values to each of the two frequency-control registers for the computer's first two voices. (See Figure 1.)

For example, when keypad 5 has been pressed, two tones with frequencies 770 and 1336 Hz (cycles per second) are "played" simultaneously by the phone. Equipment at the telephone company's central office decodes these tones and dials the phone you're calling.

These tones can be generated on the talented 64 by poking the numbers 87 and 49 into voice 1's frequency control registers and 156 and 85 into

voice 2's frequency control registers.

Where did these pokable values come from? As we've seen in previous columns, any tone—within limits—can be produced on the 64 as long as we know its decimal value. Appendix E of the *Programmer's Reference Guide* lists the decimal values (and pokable numbers) for a wide range of equal-tempered musical pitches, such as those produced by a piano.



Touch-tone frequencies, based on an internationally accepted standard, don't coincide with standard musical pitches. After a little detective work, I came up with a constant (slightly more accurate than recommended in the *Programmer's Reference Guide*) to calculate the decimal value for any musical frequency.

DECIMAL VALUE = FREQ IN HERTZ/.0609593

Round the result to the nearest whole number. The decimal value is then converted to pokable values as follows:

SECOND POKABLE VALUE = INT(DECIMAL VALUE/256)

FIRST POKABLE VALUE = DECIMAL VALUE - SECOND VALUE * 256

Continuing with our example, we convert 770 to the decimal value 12,631 by dividing it by the constant .0609593 and rounding. Next, we convert 12,631 to pokable values 49 and 87 by first dividing it by 256 and then dropping the remainder, resulting in 49. Then we multiply 49 by 256 to get 12,544, which we subtract from 12,631, yielding 87. Likewise, 1,336 is converted to decimal number 21,916, then converted to pokable values 85 and 156. These numbers are reversed in the table because of the order in which they're poked.

We begin the program by setting up the screen with blue printing on a white background.

```
10 PRINTCHR$(147):POKE646,6:POKE53280,1:POKE53281,1
```

Next, we dimension two arrays to correspond to the number of names the program can handle and the number of digits in the longest phone number.

```
20 DIMNU$(22),DS$(14)
```

NU\$() will be the telephone number in string format. We'll use the first two of the 64's three voices to generate the tones. Define their frequency registers.

```
30 F(1)=54272:F(2)=54273:F(3)=54279:F(4)=54280
```

Define the memory registers that turn voices 1 and 2 on and off.

Figure 1.

Keypad Number	Frequency (Hertz)	Decimal Equivalents	Poke into Voice 1		Poke into Voice 2	
1	697 and 1209	11434 and 19833	170	44	121	77
2	697 and 1336	11434 and 21916	170	44	156	85
3	697 and 1477	11434 and 24229	170	44	165	94
4	770 and 1209	12631 and 19833	87	49	121	77
5	770 and 1336	12631 and 21916	87	49	156	85
6	770 and 1477	12631 and 24229	87	49	165	94
7	852 and 1209	13977 and 19833	153	54	121	77
8	852 and 1336	13977 and 21916	153	54	156	85
9	852 and 1477	13977 and 24229	153	54	165	94
0	941 and 1336	15437 and 21916	77	60	156	85

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40 G=54276:H=54283

The square waveform simulates the phone's dialing sounds. Define two constants to turn that waveform on and off.

50 VN=65:VF=64

Clear the sound chip, turn up the volume, and define the shape of the square wave.

60 FORL=54272TO54295:POKEL,0:NEXT
70 POKES4296,15 80 POKES4275,8:POKES4282,8

The envelope (how fast a sound begins and ends, among other things) was chosen by trial and error to emulate the sounds produced by a telephone.

90 POKES4277,20:POKES4284,20
100 POKES4278,192:POKES4285,192

Now for the tricky part. We'll fill a two-dimensional array with the pokable values from the chart above. The telephone keypad itself can help us fill the array: All of the three keys on any horizontal row share a common frequency, and all of the three keys on any vertical column share another common frequency. For example, the 1, 2, and 3 keys share frequency 697; the 1, 4, and 7 keys share frequency 1209.

Let's do the keypad rows first. Since phone keys 1, 2, and 3 share the first two pokable values 44 and 170, we can use a FOR-NEXT loop to simplify loading the array with charted values. N is the keypad number.

120 FORN=1TO3:W(1,N)=170:W(2,N)=44:NEXT

The two frequency-control registers for voice 1 are represented by the 1 and 2 inside the parentheses. After the FOR-NEXT loop has run, W(1,1), W(1,2), and W(1,3) will contain 170; W(2,1), W(2,2), and W(2,3) will contain 44.

Keys 4 through 9 are loaded similarly, but with another frequency.

130 FORN=4TO6:W(1,N)=87:W(2,N)=49:NEXT

140 FORN=7TO9:W(1,N)=153:W(2,N)=54:NEXT

The 0 key is a special case.

150 W(1,0)=77:W(2,0)=60

Now we'll load the frequencies that correspond to the columns of keypad numbers. The first column contains the keys 1, 4, and 7. Use STEP3 in the FOR-NEXT loop.

160 FORN=1TO7STEP3:W(3,N)=121:W(4,N)=77:
NEXT

The 3 and 4 inside the parentheses represent the third and fourth frequency-control values—the ones that control voice 2. The second and third keypad columns' frequency values are loaded into the array next.

170 FORN=2TO8STEP3:W(3,N)=156:W(4,N)=85:
NEXT

180 FORN=3TO9STEP3:W(3,N)=165:W(4,N)=94:
NEXT

Again, the 0 is a special case.

190 W(3,0)=156:W(4,0)=85

Figure 2 is a picture of the two-dimensional array, all loaded with pokable values.

Figure 2.

	W(1,1)	W(2,1)	W(3,1)	W(4,1)
1	170	44	121	77
2	170	44	156	85
3	170	44	165	94
4	87	49	121	77
5	87	49	156	85
6	87	49	165	94
7	153	54	121	77
8	153	54	156	85
9	153	54	165	94
0	77	60	156	85

Keypad No.

W(1,0) To Voice 1 To Voice 2 W(4,0)

That's all we have space for this month. Next month we'll create the directory and dial the phone. □

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PROGRAMMER'S PAGE

R A N D Y T H O M P S O N

Did you know that the 64 doesn't care whether a number or a string is put between the parentheses in a PEEK function? Did you know that the test IF \$\$ will *not* produce a syntax error? Did you know that the INPUT statement can be used without an accompanying input variable?

Yes, it's time for more weird computer facts. All the following tips are not useful, but they are unusual.

DIM-Witted Programs

Did you know that you can dimension nonarray variables? The command DIM X, for example, is perfectly legal. So is DIM \$\$\$. In fact, you can sprinkle DIM X and DIM \$\$\$ all throughout your program without risking a REDIM'D error. The DIM statement doesn't affect the value of the variable being dimensioned.

Although it may appear as if nothing happens when you dimension a nonarray variable, BASIC does perform some elementary recordkeeping duties the first time a variable is used in a DIM statement (or any other statement, for that matter). Commodore BASIC keeps track of variable names and values using a table that's located just above the BASIC workspace. Every time you use a variable, BASIC searches this table for the specified variable. When BASIC can't find an entry for a variable, it creates one. This happens whenever a variable is referenced for the first time. So by placing the command DIM X as the first line in your program, you force BASIC to make room for the variable X in memory. Of course, you could just as easily use the command X = 0 to get the same results.

Now the obvious question: Why would you want to use DIM on anything other than arrays? There really is no good reason—unless your goal is to confuse anyone who might be peeking at your program listing.

REMLess Remarks

Not all program remarks have to be preceded by a REM statement. For example, you can type anything you

want after a GOTO command. Try it—BASIC won't mind. This little quirk comes in quite useful for inserting short comments about the destination of the preceding GOTO statement. For example,

90 GOTO 210 -> JUMP TO PRINT ROUTINE

makes for quite readable code.

The reason this works is simply because BASIC is never given the opportunity to evaluate the characters that follow a GOTO statement. For the same reason, you can dedicate an

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COMPUTER FACTS

entire BASIC line as a REMless remark as long as that line is never executed by the program. A good example of this would be a subroutine where the initial remarks appear in program lines that are skipped by the calling GOSUB statements.

Missing Parameter

The MID\$ function requires three parameters, or does it? Without the third parameter, MID\$ returns all the characters to the right of, and including, the character specified by the second parameter. In the example

LN\$ = MID\$("WALTER HEGO",7)

LN\$ is set equal to the last name HEGO.

This shortened version of MID\$ is useful when you want to perform a RIGHT\$ and know only where in the string the characters begin, not how many characters you need.

Dead End

You've heard of the CONT statement: You use it to restart a BASIC program after a STOP command or after you've hit Run/Stop. As you might expect, CONT was designed to work from immediate mode only (that is, from the READY prompt). Surprisingly, you *can* use CONT from within a program, if you want to.

When used within a program, CONT is what you might call a *dead end* command. As soon as BASIC encounters this statement, the program hangs. It's the same as if you ran the line 10 GOTO 10. You can still press Run/Stop to abort the program, but if you then enter CONT to continue running it, your program will go right back into its blind alley.

Commodore Slang

If you learned BASIC by taking a class or reading a book, you probably use a lot of IF-THEN statements that look like this:

100 IF YN\$="Y" THEN GOTO 10

There's an easier way to do this on the 64 and 128, however: Simply remove the THEN.

100 IF YN\$="Y" GOTO 10

Or, if you prefer, put THEN back in and remove the GOTO. Now we're left with the following:

100 IF YN\$="Y" THEN 10

By using one of the contracted forms of IF-THEN, your program is made shorter and slightly faster. □



PROGRAMS

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Getting Started

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Starting address: 0801

Ending address: 1D00

Although *Stronghold* is written in machine language, it loads and runs like a BASIC program. When you're ready to play, plug a joystick into port 2, load the program, and type RUN. The title and a list of options should appear in a few seconds.

The Options

Play options are displayed on the title screen. The first one allows you to choose normal, high, or low gravity. If you're a beginner, low gravity is recommended; for more of a challenge, try high gravity. Press f1 to change gravity conditions.

The second option is to choose the number of aliens you'll encounter; press f3 to make your selection. You can choose normal, fewer, or many aliens. You should choose fewer aliens until you gain more experience as a pilot.

After all the options have been set, you must press the fire button to start the game. At any time during the game, you can press f5 to pause and f7 to quit and start a new game.

The Fortress

You begin the game with four pilots. You'll lose one pilot every time you crash, and you'll restart from the beginning or from the last platform you landed on. Every 1000 points, you'll be awarded a bonus pilot. When all of your pilots have been lost, the game is over. Press the fire button at this point if you want to begin a new game.

STRONGHOLD

THIS RESCUE GAME
FOR THE 64 TAKES
YOU THROUGH
DANGEROUS
CAVERNS ON AN
ALIEN WORLD.
JOYSTICK REQUIRED.

The stronghold is a made up of two levels with 32 screens on each level. You must navigate through many tunnels and caverns and over rocky terrain. Maneuver your ship in all directions by using the joystick. Press the fire button to shoot.

When you fly to the edge of one screen, the next screen will appear. As you explore the stronghold, you'll encounter many objects. Some of these will be white platforms. These are the only places where you can land your ship. As explained earlier, it's a good idea to land on these from time to time as you move deeper into the fortress.

You'll also encounter lasers and crushers, which, respectively, fire and open and close at regular intervals. Watch their timing to pass by safely.

You'll also find colored security boxes. To take advantage of these color codes, gently touch the box with your ship. You'll notice a security dis-

play at the lower right side of your screen. This indicates your security clearance. Many times during the game, you'll find that your path is blocked by a colored security barrier. You may pass through a barrier only when the color of your security clearance matches that of the barrier. If you do not have the proper security clearance, you must search for a security box of that color.

The stranded crew members are scattered throughout the two levels of the stronghold. When you locate a man, gently touch him with your ship, and he'll be rescued. In the lower center of the screen, a display shows how many men are yet to be rescued. A rescued man gives you 250 points. If you accidentally shoot a man, no points will be awarded.

Sooner or later, you'll discover an alien that resembles a jellyfish digging through the ground beneath you. It may enter your cavern. If you shoot the alien, it will collapse and die, and you'll be awarded 50 points.

The Ice Stronghold

Complete the first level, and you'll enter the ice stronghold. Here, the graphics become more detailed and the maze of catacombs more complex. When you enter this level, your security clearance is reset. When you leave the ice level, it will be restored to its original color.

The ice level is very difficult to complete. The passageways are narrow, and the men are lost deep in the ice caves. When you've found all six security codes, you'll reach the final screen and possibly find the wreck of the *Starship Explorer*. The huge mother alien will be moving from side to side to side, guarding the last man. It will require careful timing to avoid her. You may find that violence is not always called for when dealing with aliens.

By this time, if you haven't located all nine men, you must go back and search for the rest. Once you've rescued them, fly back to the start of the first level and land on the platform to win the game. >



PROGRAMS

STRONGHOLD

0801:0B	08	70	17	9E	32	34	30	6E	0A51:07	1C	0F	92	6B	9C	B3	17	47	0CB1:30	18	39	19	69	4D	C6	06	B4
0809:37	00	00	00	20	20	20	20	96	0A59:5B	2C	01	5A	21	CB	12	52	9A	0CB9:22	89	0C	CE	11	AD	10	17	2A
0811:20	20	20	20	20	A0	C4	B9	06	0A61:30	3B	89	A8	22	0A	82	A0	F6	0CC1:60	84	86	CE	87	AD	0C	97	8B
0819:3C	08	99	F8	00	B9	FD	08	F6	0A69:A2	33	28	03	08	8F	0B	CD	33	0CC9:25	E0	20	3A	41	CD	23	CF	AB
0821:99	33	03	88	D0	F1	A0	09	4C	0A71:56	23	04	02	85	15	55	B0	F5	0CD1:A6	CE	18	21	CF	26	8F	04	40
0829:B9	0C	08	99	FF	03	88	D0	A1	0A79:16	21	B0	00	0B	14	11	C5	87	0CD9:86	DC	8D	05	C0	AA	8A	29	5D
0831:F7	A9	EF	85	2D	A9	26	85	DF	0A81:42	C6	15	38	14	08	02	4D	A0	0CE1:D0	AD	17	01	3A	C1	38	AD	B7
0839:2E	4C	00	01	15	60	01	EF	9F	0A89:4E	21	50	A8	08	88	50	31	D5	0CE9:22	E9	04	20	96	62	C0	1C	EB
0841:26	73	1B	B9	6E	09	99	E8	F3	0A91:20	C2	00	0C	03	A3	BF	A0	ED	0CF1:CF	D2	44	86	99	85	40	B9	B4
0849:07	C8	D0	F7	EE	02	01	EE	19	0A99:01	6F	00	4F	A0	05	5B	C0	8F	0CF9:88	99	85	40	C0	44	1C	FF	C0
0851:05	01	C6	F9	D0	ED	A2	03	23	0AA1:1D	2C	D8	10	15	56	F0	02	51	0D01:00	60	0A	07	B9	2A	CE	4A	43
0859:20	34	03	F0	33	C9	07	D0	95	0AA9:22	68	23	A2	84	22	08	67	9B	0D09:68	60	44	83	EF	71	03	01	7C
0861:16	A2	01	20	34	03	D0	0A	A0	0AB1:02	42	1C	08	88	00	0A	08	BB	0D11:AD	49	80	87	CA	7A	1E	40	99
0869:A2	04	20	34	03	18	69	07	65	0AB9:00	28	80	0B	22	02	90	82	55	0D19:AD	40	12	E0	A1	C9	1E	11	EB
0871:10	05	A2	0A	20	34	03	85	1D	0AC1:80	40	80	80	20	C0	80	C0	04	0D21:10	AD	90	04	90	A8	C8	07	C0
0879:A8	A5	A7	85	A9	A5	FE	85	FB	0AC9:F2	38	08	FD	79	8C	FC	78	B6	0D29:20	CB	42	EE	5B	AD	40	12	A1
0881:F7	A5	FF	85	F8	20	6C	03	73	0AD1:44	94	78	14	C4	51	10	87	90	0D31:C9	3A	28	37	30	8D	C7	07	85
0889:A5	F8	85	FF	A5	F7	85	FE	72	0AD9:7E	80	04	15	3B	50	93	71	D2	0D39:EE	C6	FB	A8	8C	8A	0A	00	49
0891:E8	20	34	03	D0	1E	A2	08	21	0AE1:11	E3	B1	90	E1	51	10	87	B2	0D41:64	42	AC	FD	9F	98	12	F2	0A
0899:20	34	03	A0	02	84	A8	85	2A	0AE9:40	21	20	D0	08	30	08	FC	85	0D49:AD	58	09	90	B9	91	47	62	7F
08A1:A6	18	A5	FC	65	A6	85	F7	5F	0AF1:81	78	00	88	7C	FF	FF	BC	06	0D51:C8	4C	05	44	AD	42	0F	C1	7C
08A9:A5	FD	65	A7	85	F8	20	6C	EF	0AF9:22	32	3C	16	8A	82	0E	00	0F	0D59:39	D0	6C	EE	DB	82	A6	8D	84
08B1:03	4C	13	01	E8	20	34	03	FB	0B01:70	09	81	90	08	66	10	08	CC	0D61:FE	9F	C0	E1	02	43	91	C9	23
08B9:D0	1C	A0	03	84	A8	E8	20	36	0B09:18	92	3B	15	2E	23	15	55	06	0D69:3C	B0	60	E0	1E	3B	56	80	F2
08C1:34	03	F0	08	A2	08	20	34	F4	0B11:54	7E	17	45	44	51	10	87	37	0D71:C9	F9	D0	10	A9	F8	C0	0F	CB
08C9:03	4C	5C	01	A2	0B	20	34	BF	0B19:40	21	7A	AA	AD	7F	FF	FD	FA	0D79:FD	39	0F	F6	39	0F	A9	F9	85
08D1:03	E6	A7	4C	5C	01	E8	20	AF	0B21:55	55	55	50	F1	C7	10	8F	5F	0D81:8D	FD	99	04	FE	8D	EC	D6	54
08D9:34	03	D0	0A	E8	20	34	03	B2	0B29:9F	3A	78	7E	E6	10	7C	28	2D	0D89:F7	8D	FA	07	8A	54	1B	84	33
08E1:18	69	04	A8	D0	D6	E8	20	37	0B31:39	76	04	12	44	3C	40	04	BA	0D91:1B	77	83	C3	A6	A2	1E	CA	8A
08E9:34	03	D0	0A	A2	02	20	34	21	0B39:0A	01	78	11	B8	10	01	38	F4	0D99:23	11	3D	F0	F0	05	C9	F1	61
08F1:03	18	69	06	D0	ED	A2	08	A2	0B41:11	28	04	28	44	6C	40	20	61	0DA1:5C	6E	28	C9	38	4C	43	A0	41
08F9:20	34	03	D0	E6	A9	00	85	F7	0B49:42	97	7C	3C	7E	3C	1E	42	1D	0DA9:32	12	7C	00	39	05	D0	01	71
0901:A7	A4	FB	F0	0C	06	FA	2A	37	0B51:3C	0E	EA	18	C8	08	00	00	4E	0DB1:D0	8D	03	52	FE	F2	88	59	4B
0909:26	A7	C6	FB	CA	D0	F2	A8	D8	0B59:FF	4C	22	47	13	00	BE	90	E1	0DB9:21	02	6B	73	4C	65	20	C5	87
0911:60	48	B1	FE	85	FA	A9	08	FE	0B61:E1	51	10	C7	5F	E5	53	43	B7	0DC1:61	01	54	60	26	D1	F0	17	CE
0919:85	FB	68	A4	FE	D0	02	C6	4A	0B69:4F	52	45	65	80	00	30	30	4F	0DC9:0A	CE	02	12	FF	0F	C8	1C	E7
0921:FF	C6	FE	C0	E7	D0	DE	A4	BA	0B71:30	43	28	EA	89	9E	39	B5	13	0DD1:40	00	92	31	14	07	CE	60	2C
0929:FF	C0	07	D0	E8	A9	37	85	BA	0B79:50	C8	52	9E	34	AE	B6	53	9B	0DD9:EE	96	AD	02	00	4D	90	38	75
0931:01	58	4C	28	08	A4	A8	F0	FA	0B81:45	43	55	52	B1	0E	20	8D	6E	0DE1:29	3E	32	62	03	4C	B6	43	86
0939:22	A5	F7	38	E5	A8	B0	03	7E	0B89:A4	0E	A2	00	CA	D0	FD	CE	2E	0DE9:51	A0	EE	91	1D	01	73	51	F0
0941:C6	F8	38	85	F7	A5	FC	E5	8A	0B91:00	CF	84	1F	8A	AD	21	29	94	0DF1:44	80	F9	8D	B8	01	07	CF	0E
0949:A8	B0	02	C6	FD	85	FC	B1	3A	0B99:FE	A0	A7	A5	01	29	FB	92	DD	0DF9:AD	83	25	00	69	01	53	62	C8
0951:F7	88	91	FC	98	D0	F8	C4	42	0BA1:A8	E0	FA	90	10	A9	D0	B2	28	0E01:08	CF	2C	81	CE	10	D0	2E	39
0959:A9	F0	0A	B1	F7	C6	FD	C6	76	0BA9:A9	38	A0	0F	28	B1	FA	91	37	0E09:C3	A8	99	00	D4	C8	C0	18	C7
0961:F8	C6	A9	10	EC	60	78	E6	98	0BB1:FC	41	06	FA	61	FA	68	24	F2	0E11:D0	F8	14	3F	AB	46	66	31	BE
0969:01	4C	16	08	60	00	0B	08	73	0BB9:80	A1	FB	18	A5	FC	69	01	6E	0E19:8A	0A	FF	4F	67	31	9E	8A	B9
0971:0A	00	9E	32	30	38	38	00	52	0BC1:85	FC	A5	FD	69	00	85	FD	C2	0E21:A9	28	8D	0F	09	58	06	9C	11
0979:26	08	14	00	8F	20	44	41	E9	0BC9:A5	FB	C9	D4	D0	DC	ED	7F	8D	0E29:C9	60	98	AA	20	3C	42	8A	01
0981:4E	45	59	20	31	21	3F	39	61	0BD1:B0	83	99	08	3A	ED	80	9F	FE	0E31:A8	E2	F0	35	C0	C9	09	88	93
0989:1B	7C	E4	20	20	20	20	20	C8	0BD9:FC	37	85	01	75	51	0E	DC	E6	0E39:8A	B2	DD	AA	4C	0E	44	92	63
0991:20	E8	CF	0C	08	6A	85	FB	99	0BE1:15	B7	88	BD	D8	32	71	C5	95	0E41:34	BD	F5	45	C9	40	3A	2F	EC
0999:69	85	85	25	A9	1E	85	FC	92	0BE9:02	8D	22	53	08	8D	23	30	CA	0E49:C0	07	B8	E6	C0	DB	C8	EF	FC
09A1:69	08	85	26	18	A9	EA	9F	5A	0BF1:07	11	13	10	58	42	07	22	2F	0E51:C0	28	D0	E8	C5	F0	8F	59	EA
09A9:FB	85	27	A9	3C	65	FC	85	91	0BF9:8F	C0	88	1A	23	D6	1A	DC	40	0E59:78	E4	88	4C	50	42	9D	94	1C
09B1:28	A2	FF	C8	FD	01	08	8C	9D	0C01:D1	FC	8D	FF	23	FB	8D	FE	16	0E61:E8	88	C0	B4	C1	11	BE	C2	0A
09B9:02	08	F0	04	B1	25	91	27	99	0C09:B0	21	C0	B4	86	A3	35	08	5A	0E69:E5	44	72	07	C8	A8	92	4C	A2
09C1:C6	25	E4	25	4B	F4	83	26	CA	0C11:8D	8D	28	75	29	E0	E3	2B	6C	0E71:52	44	60	43	2A	09	23	67	2B
09C9:C6	27	E4	27	D0	02	C6	28	5C	0C19:39	91	2D	52	9F	91	A9	68	FB	0E79:C3	FA	A7	21	00	9E	9C	46	37
09D1:C6	FB	E4	FB	D0	E6	C6	FC	4F	0C21:8D	17	88	04	50	32	04	CC	37	0E81:78	1A	E2	70	82	9C	1E	8D	14
09D9:E4	FC	D0	E0	A5	28	C9	A0	C7	0C29:44	72	D0	29	21	C0	03	40	FE	0E89:22	BD	8E	0F	9C	9C	8D	12	6D
09E1:B0	0A	85	34	85	38	A5	27	42	0C31:6A	B1	47	4E	8B	51	19	02	8E	0E91:00	F0	0D	E1	E5	9D	13	C9	BE
09E9:85	33	85	37	4C	BC	52																				



PROGRAMS

0F11:66	C4	48	49	4B	1D	62	9A	5F	1171:A9	00	8D	15	D0	8D	10	D0	19	13D1:72	E6	A4	61	29	0C	0A	1A	3D
0F19:1A	83	5B	46	33	5D	D2	A5	4F	1179:F6	70	BF	13	11	21	00	F7	61	13D9:83	0B	78	64	9D	9A	15	2C	87
0F21:9F	B9	49	90	4D	53	3A	1A	F5	1181:5E	07	75	0C	64	04	00	FF	37	13E1:51	0A	13	B5	8C	89	E2	A5	E6
0F29:1F	91	03	46	45	57	53	D8	07	1189:A9	C1	8D	18	03	4C	12	52	E3	13E9:0B	79	22	69	60	D3	76	18	26
0F31:80	52	97	03	40	92	20	12	E5	1191:7F	E0	78	87	38	07	82	91	A7	13F1:36	60	E6	DF	4B	32	D8	0C	07
0F39:B2	EF	59	20	92	3C	F6	1C	69	1199:01	E8	7A	90	2A	C8	5A	B2	AA	13F9:81	08	69	52	0D	44	2F	83	90
0F41:1D	A2	50	1C	8A	A2	42	55	1B	11A1:78	A4	81	D0	78	BE	E2	75	60	1401:A2	D0	99	2D	47	27	03	1E	AF
0F49:54	C6	06	C0	AE	D8	45	47	BA	11A9:78	7A	7A	C8	AA	A5	13	A0	35	1409:86	0D	9D	0F	79	5A	0A	83	29
0F51:AB	14	81	6B	8E	28	49	53	2C	11B1:60	6A	70	00	C8	C9	41	5B	F7	1411:0E	C6	20	0F	1E	A1	5B	86	9B
0F59:53	A3	00	20	47	41	2E	8D	35	11B9:01	C8	82	81	6C	AC	12	07	38	1419:2E	45	64	CF	C5	FC	14	14	91
0F61:00	14	AA	52	05	02	72	32	46	11C1:50	03	DC	AA	1C	04	FF	B0	B4	1421:C5	CF	32	3C	3F	3E	F1	30	31
0F69:38	36	2A	E0	02	CE	20	2E	3E	11C9:82	80	05	28	51	14	EE	06	2F	1429:6C	FC	CC	4A	23	53	38	17	F2
0F71:C3	83	71	20	50	49	EF	1E	28	11D1:64	4A	83	70	07	A0	63	27	D8	1431:CF	AA	BD	0C	B4	62	C2	0E	27
0F79:DC	41	57	41	52	44	54	63	05	11D9:9C	08	7D	9B	C7	82	30	82	E0	1439:31	D8	08	81	2D	69	52	09	06
0F81:03	EA	8E	D0	8C	D4	22	B2	69	11E1:CD	2C	80	70	88	26	80	C0	AB	1441:C4	93	04	45	04	0E	0C	85	7B
0F89:0E	AC	E2	10	E2	52	64	09	69	11E9:3C	AA	30	70	8C	6D	04	08	0C	1449:A8	80	2A	09	C8	C8	C8	4C	03
0F91:4A	4D	9B	E8	8C	64	53	45	0C	11F1:79	82	52	06	CC	78	C9	88	80	1451:7E	50	86	CD	05	CF	F0	04	C7
0F99:0A	B9	03	54	45	90	68	C1	CF	11F9:78	80	7C	41	78	90	5A	B4	9B	1459:88	4C	8A	4C	2D	6E	0B	06	79
0FA1:B5	49	43	3A	CC	F0	90	DD	22	1201:6C	20	3C	50	02	09	25	78	E6	1461:63	10	07	D0	C8	B9	DF	49	63
0FA9:18	C8	28	29	2E	A0	27	53	33	1209:B4	C9	60	E6	7C	05	83	80	F3	1469:77	06	A9	DB	A9	05	12	99	E0
0FBI:07	54	4E	98	E2	A8	4E	13	25	1211:B0	AE	48	F8	90	87	C9	06	0E	1471:15	62	4E	87	C9	3E	F0	47	6F
0FB9:24	60	02	85	42	0D	F8	20	F2	1219:20	06	90	64	91	08	2C	DC	09	1479:93	71	4C	01	42	60	97	45	69
0FC1:55	42	36	8A	17	93	B9	CA	F4	1221:89	80	E0	E6	94	03	81	80	E8	1481:12	78	81	68	A2	69	A0	50	D3
0FC9:98	05	20	43	32	A2	52	66	D4	1229:F8	ED	F0	13	81	90	60	36	C1	1489:8E	52	10	8C	01	81	A1	02	AB
0FD1:55	4C	41	54	49	40	73	53	A0	1231:4C	00	AF	38	03	82	10	A0	D7	1491:21	63	68	18	69	6B	28	AD	A8
0FD9:A4	07	2E	20	48	41	56	4A	12	1239:68	05	82	40	60	65	02	82	46	1499:07	14	7A	08	C6	F0	8A	0E	37
0FE1:14	52	D9	55	68	38	41	4C	22	1241:70	AF	3A	04	82	B0	8C	36	37	14A1:4B	CA	DC	42	C0	38	B9	0D	44
0FE9:4C	3A	94	20	59	4F	55	12	16	1249:04	83	10	50	98	07	83	50	8F	14A9:99	D4	E0	24	71	4D	AD	2D	7B
0FF1:4D	45	4E	C6	4E	41	4E	E8	3B	1251:50	94	06	83	60	40	C2	CB	11	14B1:E9	92	E2	A9	FC	8D	FF	07	8F
0FF9:45	53	43	41	50	45	80	2B	CF	1259:04	08	40	50	01	B1	80	50	AE	14B9:AD	C1	0B	00	21	1D	67	04	DA
1001:C1	45	20	53	C6	42	60	A3	30	1261:90	43	80	A0	55	67	01	80	83	14C1:0A	38	E9	04	8D	17	B4	29	D5
1009:48	4F	4C	44	21	65	81	00	90	1269:D0	DD	94	C5	13	10	C8	C8	8F	14C9:04	43	91	00	A4	85	D8	2C	10
1011:11	11	72	4E	4F	57	2C	20	81	1271:81	40	AC	3A	00	81	A0	01	E7	14D1:0E	15	78	80	6F	0B	EE	A5	88
1019:46	4F	52	20	41	20	4C	4E	EE	1279:78	02	38	30	BE	65	18	50	70	14D9:10	DC	B0	0C	1F	2F	08	AD	8B
1021:4E	47	84	9E	52	49	50	20	2D	1281:8C	01	4D	82	A0	46	65	00	E6	14E1:04	D0	69	90	04	C5	02	4B	FC
1029:42	41	43	4B	20	54	4F	20	E8	1289:82	C0	C8	36	00	83	00	B4	5E	14E9:51	50	E8	2B	34	21	20	04	09
1031:45	41	52	54	48	2E	2E	2E	59	1291:36	01	83	30	F0	95	01	00	64	14F1:43	E0	11	8B	62	10	18	C5	18
1039:20	20	14	12	01	09	0E	05	62	1299:70	37	C9	FA	F1	C9	08	81	F4	14F9:10	39	81	92	35	02	0A	5C	F3
1041:12	A0	83	7F	00	85	A9	15	79	12A1:B4	E2	6A	06	8D	16	8F	01	6B	1501:36	84	4C	68	50	4C	53	50	22
1049:8D	18	E7	D7	21	70	B0	D0	AD	12A9:8D	17	C0	08	4F	E4	A7	C0	11	1509:4D	30	DB	4C	A8	50	EE	98	23
1051:CC	6C	16	0A	85	1A	2C	20	63	12B1:D8	D0	D9	60	02	1D	8D	0C	63	1511:AD	80	28	CD	22	CF	98	4B	E0
1059:50	56	30	50	02	0D	0B	A9	E7	12B9:3A	CA	90	9B	8D	0E	EA	81	71	1519:81	2F	0D	19	AD	30	12	00	55
1061:AA	2C	0B	5F	E0	30	00	0E	0F	12C1:40	32	E6	C8	61	29	78	4D	E9	1521:0F	D9	E4	D4	81	B9	41	2C	DA
1069:67	03	03	38	1B	C0	06	D9	A3	12C9:A8	8D	08	10	4C	8D	07	81	CF	1529:9A	4D	20	13	43	EE	5A	00	B3
1071:00	C6	01	20	D5	B0	04	61	40	12D1:1D	80	88	48	8D	0B	D5	0F	8D	1531:0E	C9	03	AA	E2	0C	02	88	B3
1079:44	20	9B	44	D4	17	68	C7	17	12D9:8D	18	60	1A	20	71	82	A0	E4	1539:06	68	DC	C0	A1	30	02	69	63
1081:73	F2	20	E8	47	A5	C5	C9	D0	12E1:05	21	08	8D	06	B0	03	E8	8C	1541:EC	EF	4D	AB	B6	42	03	C2	C9
1089:16	0A	FE	77	04	F0	1A	8E	35	12E9:00	D4	8E	01	D4	A9	21	8D	42	1549:84	0F	C9	0E	B7	C9	0D	40	D2
1091:9C	2B	8C	0D	E8	E6	A9	93	F6	12F1:04	D4	60	86	FE	84	FF	A0	6C	1551:02	07	F0	31	C9	0B	F0	1F	EA
1099:20	D2	FE	8E	81	4C	00	49	ED	12F9:84	A2	30	86	FC	84	FD	AA	18	1559:4C	61	4E	E1	F8	41	09	3C	05
10A1:DE	3F	50	C0	02	50	54	00	11	1301:CA	E0	A2	C1	CF	11	8B	4A	59	1561:40	09	E2	9F	07	60	CE	57	F2
10A9:F8	50	EE	E4	08	40	CE	C9	2F	1309:3C	8E	4A	CA	4C	4A	9D	2E	C0	1569:CF	4E	50	19	87	4C	93	32	71
10B1:03	B4	65	97	38	28	44	CE	60	1311:70	30	FC	91	FE	D3	61	82	C0	1571:F1	93	86	CE	A6	A1	50	69	FC
10B9:4C	6F	C4	51	40	FF	9F	26	F0	1319:F7	A5	FE	BC	31	28	85	FE	84	1579:3D	10	58	F8	07	EE	E0	21	B7
10C1:D9	1B	47	99	10	04	B4	42	54	1321:A5	FF	28	43	FF	A5	FC	18	F8	1581:20	3F	10	06	4F	0E	41	64	87
10C9:07	F2	4C	82	47	66	BB	71	98	1329:69	FC	A5	FD	D2	99	FD	E8	B9	1589:14	00	23	04	74	08	41	6D	16
10D1:2C	14	08	C9	C8	F0	00	B8	6D	1331:E0	06	D0	D6	D4	38	19	2B	B5	1591:FF	E3	2A	38	B2	60	77	72	F5
10D9:FC	9F	AD	DD	21	C9	F6	F0	03	1339:86	F8	84	F9	5E	B1	FA	A6	37	1599:0D	C1	A4	82	15	11	01	0B	71
10E1:98	F6	86	14	A9	F7	64	F1	06	1341:F8	FA	A4	F9	20	98	4A	46	9C	15A1:A3	03	13	60	AA	20	63	A1	05
10E9:60	35	86	D8	45	C9	41	90	4A	1349:F8	69	0A	85	F8	A5	F9	01	33	15A9:23	59	C8	28	C8	07	4E	20	76
10F1:03	38	E9	40	A2	38	06	81	6E	1351:38	43	F9	18	A5	FA	69	01	12	15B1:31	4E	4C	0F	E0	3C	C0	27	



PROGRAMS

1631:E9 D2 05 CF CE 0A 43 8A 54	1891:E4 30 CF A9 0B 8D 86 02 72	1AF1:30 14 3A 30 00 56 F0 17 DF
1639:4E A9 40 20 7D 34 01 9E 5E	1899:A9 93 20 D2 04 B9 1A 8B 7B	1AF9:C7 5D 06 C4 1C 37 19 0F 75
1641:F8 84 EE E9 0C 52 4B 85 4D	18A1:08 3C 42 20 C5 E1 50 42 C7	1B01:19 1E 28 85 49 C6 53 1C D0
1649:10 01 0F A2 00 8E 82 25 2E	18A9:AE 25 CF AC 26 CF 8E 04 D0	1B09:1A 04 0D 01 86 3C C4 B1 5F
1651:86 50 60 EE A2 87 82 01 09	18B1:CF 8C 05 CF AD 29 91 74 34	1B11:53 10 64 3C 04 34 0F 75 C9
1659:46 04 1A 84 60 A9 08 8D 7C	18B9:04 18 CF 20 52 4B AD 27 30	1B19:B8 02 04 04 04 09 B4 2E C8
1661:20 CF AD 1F 86 97 02 F0 C0	18C1:E0 05 00 D0 AD 28 CF 8D EB	1B21:1B 03 02 0A 01 01 28 0A EC
1669:1C 98 3B 88 01 01 F0 11 B8	18C9:01 D0 A9 FF C6 3D A9 00 62	1B29:0B 09 60 01 06 52 09 18 E6
1671:53 0D 6B A4 09 1A AD 05 53	18D1:8D 1E D0 8D 1F D0 20 D4 94	1B31:01 39 0D 09 C2 50 18 00 EF
1679:60 CE 05 D0 B6 CD 41 26 CC	18D9:3A 5E AE 4D 20 68 43 20 B2	1B39:43 C6 08 08 00 0D 0C 0C 9C
1681:41 A1 20 01 B0 0D 85 0C 9B	18E1:48 00 5C A1 41 20 DC 42 62	1B41:01 58 02 02 02 12 88 7D 55
1689:E9 3A 6E AD 45 CD 0A CF 27	18E9:A9 02 20 4A 40 20 F4 40 C4	1B49:85 82 C8 9C 99 89 B9 96 C2
1691:F0 05 B0 03 0C 78 71 D1 B4	18F1:B9 86 4F 20 D8 51 4C 99 CA	1B51:60 98 80 F4 2B 80 8A 69 17
1699:2C D4 08 00 0A 07 0B D0 65	18F9:52 FF 00 FF 00 72 08 50 7D	1B59:B8 55 BA 96 1A 30 90 84 39
16A1:A2 14 4C 4E 77 AD 1E 68 A9	1901:85 FB 69 19 85 25 A9 07 CE	1B61:E8 A9 1E 9A A9 E9 3F 00 57
16A9:41 F0 4F C9 81 F0 21 C9 15	1909:85 FC 69 53 85 26 18 A9 3E	1B69:BF AF B6 A5 D0 30 FE FA DC
16B1:21 F0 D2 C9 11 F0 61 C9 7A	1911:B0 65 FB 85 27 A9 7F 65 11	1B71:D0 42 5A A5 A5 A5 AF BF 29
16B9:12 F0 48 C9 09 F0 3E C5 1F	1919:FC 85 28 A2 FF A0 00 8C 69	1B79:7D 5A 5A 5A FA FE 00 C0 C9
16C1:05 AF 0C 3D C9 05 F0 A2 98	1921:A7 02 8C A8 02 F0 04 B1 51	1B81:00 59 59 69 65 55 55 64 5F
16C9:C9 22 F0 A4 C9 0A F0 AB CF	1929:25 91 27 C6 25 E4 25 30 DA	1B89:54 18 18 14 2C D0 76 10 D5
16D1:60 AD A2 47 C9 F0 10 5F F3	1931:FC 41 26 C6 27 E4 27 D0 4F	1B91:30 30 14 A5 C4 F4 05 50 59
16D9:8D E7 DB A2 64 CB 93 F0 D6	1939:02 C6 28 C6 FB E4 FB D0 CB	1B99:2B 80 00 90 98 28 AE 6D BE
16E1:F3 D0 AD 0B CF 80 0D AE EB	1941:E6 C6 FC EA FC D0 E0 A5 19	1BA1:29 B8 00 01 06 10 01 29 46
16E9:18 CF E0 20 B0 04 21 B8 C4	1949:28 C9 A0 B0 A0 35 34 85 75	1BA9:E6 84 96 20 F8 86 DC 10 F4
16F1:41 60 98 82 10 5A 5D 51 08	1951:38 A5 27 85 33 85 37 4C B0	1BB1:10 60 4C 22 23 04 10 06 03
16F9:4C 9D 50 4C A8 C0 53 20 91	1959:00 40 02 53 78 8B 0C 91 AC	1BB9:02 03 2A FC A0 46 DD DD 7B
1701:E3 C3 A0 04 8B AE A2 C8 6B	1961:60 4C 80 43 0B 8E 41 30 60	1BC1:00 15 42 CF A3 22 18 19 71
1709:20 83 8C FF 8D FC B3 1F A0	1969:5E 83 07 07 07 B2 01 B9	1BC9:D0 51 54 CC 11 51 08 84 76
1711:20 08 12 22 09 09 82 50 77	1971:08 D2 D4 83 35 30 3A E2 F0	1BD1:D0 4F 68 7E 0B 01 98 07 CD
1719:A9 FA 4C 53 22 AC 17 E2 6E	1979:78 00 49 60 DC 09 8E DE 1E	1BD9:01 91 F1 05 4F 86 01 4D 67
1721:01 99 0C CF 41 9E CE 46 1D	1981:0C EA 62 E2 8E B9 3A DE 9D	1BE1:0C 1D 30 0A 0A C8 8C D9 72
1729:AD 40 06 20 A0 02 4C 05 AB	1989:E2 78 02 1C 33 45 0B 80 92	1BE9:0D 53 68 E0 C1 4E 94 C7 CE
1731:44 AD 19 07 77 87 5A B0 BF	1991:78 40 03 38 C3 8E 39 10 CE	1BF1:01 64 6D D4 14 05 19 01 A4
1739:B9 4F A2 01 20 E0 43 A9 31	1999:21 20 EE 0A 50 C0 F1 1A 66	1BF9:4E 4F 4F C6 B5 B1 BD E4 56
1741:F5 8D FA 2F B9 50 A5 F0 6B	19A1:0D 85 E2 29 03 26 63 0C 2E	1C01:21 00 DF C5 4C A1 84 4E 62
1749:C4 04 23 05 20 58 CF A9 3B	19A9:74 F8 76 78 FC 76 78 28 85	1C09:37 27 75 C4 A4 71 06 C2 D4
1751:32 20 AB 60 A9 B6 43 4C 17	19B1:00 83 21 C3 21 8E 8F 3A C1	1C11:0D 72 4C 41 48 0E 08 D6 6B
1759:26 42 A9 79 80 0F A9 0A 95	19B9:7E 41 70 C4 A1 14 8C 47 93	1C19:8D A3 4F 9C 84 3B 8C A0 7F
1761:8D 27 95 12 02 C2 20 48 97	19C1:D8 31 1B 0C 8F 36 C0 41 26	1C21:4F F3 5A 0C 64 BC 14 39 81
1769:4A A9 96 D1 3E 14 02 45 A2	19C9:3F 87 50 1C F9 01 08 5B 88	1C29:85 C5 41 4E 03 78 C0 C4 E2
1771:44 46 02 64 14 0C 19 19 F5	19D1:35 0A 42 16 62 23 8E 4B D2	1C31:43 4E 43 83 14 44 34 02 5B
1779:40 EE D1 30 82 5A 89 CE 20	19D9:10 92 0A 0B A1 1C 36 9E 33	1C39:45 46 95 03 14 14 02 42 BF
1781:68 22 A9 0C 8D 26 90 0F 97	19E1:A1 31 00 6D 70 0D 39 1E 50	1C41:47 48 56 50 8C 65 44 14 95
1789:8D 25 D0 00 35 36 6E 31 72	19E9:EA 30 03 C6 02 88 C9 39 69	1C49:76 19 62 05 5D 46 14 4C 18
1791:51 B2 8A 80 9F 51 A9 27 2B	19F1:22 0B 86 0C 8D 38 A4 82 A2	1C51:41 57 44 A3 06 07 4A 22 C5
1799:03 A9 00 20 FB 72 4C 62 5A	19F9:21 17 38 1E EE 70 2C 18 15	1C59:4D 4E 4E D0 A5 40 C8 23 85
17A1:52 AD FF 9F C9 81 BB 80 AA	1A01:E6 A0 88 1D BE 73 DC 07 38	1C61:01 38 1E 07 1B 76 4D F2 9C
17A9:CE 82 08 AD 48 C9 2F 02 85	1A09:EE 4C 03 23 D0 E6 32 5C B6	1C69:5B B4 65 54 14 09 90 9B EF
17B1:09 30 8D DB 07 A9 8E 8D 1E	1A11:E3 88 CC D8 04 34 D0 E1 F4	1C71:01 06 35 A0 53 08 00 01 1D
17B9:67 F0 5E 20 0F 48 33 DC 82	1A19:02 2A 81 F0 02 3A 7C E3 ED	1C79:88 41 4B D1 51 E1 B1 9B DD
17C1:29 10 C9 00 D0 F7 01 4E 78	1A21:E0 2B 64 E7 F8 07 1C 78 30	1C81:E2 41 B0 11 50 50 50 60 67
17C9:AD 0D D0 18 69 06 8D 5B 87	1A29:20 6E A0 E1 97 71 90 F1 D0	1C89:60 45 00 04 42 08 58 A1 08
17D1:70 0D AD 01 DE AD 04 2A 21	1A31:0E 3A 30 22 C7 18 30 DE 01	1C91:73 C7 42 1D 1D 19 49 30 9F
17D9:00 62 AD F1 8D 97 60 AD AE	1A39:2B 3C 14 60 7F 8E A5 82 9E	1C99:12 41 42 43 42 A7 05 5C BE
17E1:00 2A 00 60 AD 01 52 84 3B	1A41:05 C4 EA 06 77 D1 3D 47 AB	1CA1:41 4D 01 E4 F5 14 2F B0 4B
17E9:DF 01 26 A8 20 21 4A AD 5F	1A49:43 1C DA 1B 1A 19 0D 01 83	1CA9:41 20 03 4C 4D A4 44 4C 81
17F1:D4 C9 04 A4 83 AD D1 07 45	1A51:39 0C B0 00 83 00 78 C8 54	1CB1:4C 62 57 4D F7 34 CD 4C E0
17F9:C9 30 56 AD 4C 2D 48 8B F1	1A59:C0 81 87 62 6F 8E 87 0D 37	1CB9:93 10 07 44 1C 39 19 10 EC
1801:03 6A 04 07 44 06 40 04 FC	1A61:BF 42 A0 78 03 47 10 6F 66	1CC1:41 4C 74 00 2C 4D F2 43 FB
1809:02 44 08 40 04 1C 44 09 72	1A69:0B 39 03 0A 32 90 71 B7 E0	1CC9:44 43 4D 4E 4D 4C 41 58 F9
1811:40 04 17 44 19 40 04 21 7C	1A71:41 91 31 9A A1 90 F1 93 41	1CD1:44 4D 80 3C 43 41 41 49 3E
1819:44 1B 40 04 1D 44 1E 40 F0	1A79:41 B9 01 78 08 CF 40 C6 2B	1CD9:44 40 13 4B 9A 01 4B 20 EA
1821:04 1F 44 2A 40 04 2B 44 F2	1A81:5E 06 8E 5D F1 10 C7 40 AD	1CE1:12 49 49 A0 03 49 39 28 80
1829:2C 40 AA 2D CF 60 4C 22 62	1A89:C6 00 1C 04 36 01 D0 00 3C	1CE9:04 4A 44 A0 A4 79 08 F1 83
1831:F0 05 6B A4 19 19 81 8B 8E	1A91:13 90 63 01 1A CF 71 5C 3F	1CF1:38 A8 63 20 23 20 20 FF B8
1839:EE 1C 05 A0 06 D0 F2 E8 D4	1A99:C5 F1 57 07 52 0C 13 0A 7B	1CF9:C0 00 00 00 00 00 00 00 92
1841:2A 8A 10 80 4C 10 C9 63 CC	1AA1:0B 40 3D 19 7F A0 59 0C E1	
1849:4A B1 A5 C5 C9 03 F0 01 87	1AA9:02 05 05 74 30 0B B2 00 1B	
1851:60 E0 3C 15 CD 10 D0 02 15	1AB1:AF 15 1E ED 05 4C 06 E8 F3	
1859:19 80 20 9F 51 8D 20 D5 0B	1AB9:1C 94 71 9C C4 06 73 5B 99	
1861:21 D0 23 60 09 0C CF C8 26	1ACL:17 D3 C6 8E C6 E5 06 50 60	
1869:C0 09 D0 F8 A9 04 E3 4F 5A	1AC9:C6 41 C6 0B 78 DD E1 90 CA	
1871:8D 4D 20 58 40 A0 7F A2 6B	1AD1:F1 3A C7 41 06 06 01 11 F5	
1879:E0 8C 92 F0 19 8E 99 A9 7E	1AD9:1D 14 67 C5 C3 1C 27 F0 B8	
1881:84 8D 31 20 A9 8F 8D 0B 31	1AE1:70 E1 E1 51 3C 14 0E 70 D6	
1889:82 A4 1A 46 2E 40 04 2F 75	1AE9:95 11 09 09 40 0F F0 57 56	

Coming Next Month . . .

Commodore graphics guru Paul Hughes takes readers on a roundup of some of the exciting drawing and painting programs available for the 64. We'll also look at video digitizers.



PROGRAMS

KEITH GROCE

Devices to time and activate alarms for multiple events can be costly. Why buy one when your 64 can do the job, plus provide features to make things even easier?

AlarmCALC can monitor up to five events, each with different starting and stopping times. These times are displayed in a table along with the duration of each event. This program is a useful timer for general use, such as cooking or photographic processing.

The display table also contains a memo area where text may be entered to describe or name each event. Alarms can be enabled for the starting and/or stopping time for any event. Each alarm is announced by a bell and/or the flashing memo.

Getting Started

AlarmCALC consists of a BASIC program and a machine language subroutine. To help eliminate typing errors, enter the BASIC program with *The Automatic Proofreader* and the machine language program with *MLX* (see "Typing Aids" elsewhere in this section). When *MLX* prompts you, respond with the values given below.

Starting address: C083

Ending address: C47A

The BASIC program loads the machine language program, so be sure to save the latter with the filename *ALARMCLAC.ML*.

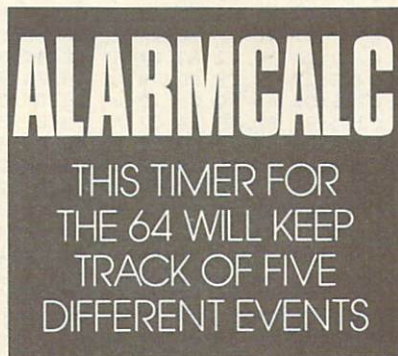
Using AlarmCALC

When you load and run *AlarmCALC*, you'll be asked to enter the current time. Enter the time in HH,MM,AM/PM format. For example, 10:35 in the evening would be entered as 10,35,PM. After the time has been entered, a table of alarm settings and memos will appear. The active cell in the table is highlighted in light green. Use the cursor keys to move the highlight.

Any of the three categories for an event (starting time, stopping time, or time difference) can be set. Use the plus (+) or minus (-) key to change

the minutes; press the plus or minus key while holding down the Shift key to change the hours.

Enable the alarms by moving to the asterisk (*) column next to the Start or Stop times. Press the F key to enable a flashing alarm, or press the B key to enable a flashing alarm with a bell. Type any short message you want in the memo column, and in any other column, press the Q key to stop the program.



AlarmCALC automatically sets the duration of an event whenever you set the starting and stopping times. Conversely, if you enter any two events, such as a stopping time and the duration, *AlarmCALC* will automatically calculate the third event. In this case, the starting time. This allows you to enter times in the most meaningful way. For example, suppose you want to have dinner at 6:18 p.m., and your roast needs to bake for an hour and 12 minutes. You would enter 6:18 p.m. for the stopping time and 1:12 for the time of duration. The starting time would be set automatically at 5:06 p.m. Enable the Start Alarm option and make a memo, and you'll be reminded to put the roast in on time. Enable the Stop Alarm option, and you'll be reminded when to take it out.

ALARMCLAC PROGRAM 1

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```
AP 10 IFA=0THENA=1:LOAD"ALARMCLAC.ML",8,1
KG 20 POKE53280,0:POKE53281,0
RB 30 TT$="{CLR}ALARMCLAC (C) 1991 COMPUTE PUBLICATIONS {DOWN}"
EP 40 PRINTCHR$(14);CHR$(154);TT$
FS 50 INPUT"HOUR,MINUTE,AM/PM";H,M,AS
DQ 60 H%=H/10:HH=H%*16+H-H%*10-128*(LEFT$(AS,1)="P"):IFH=12THENHH=164-HH
KQ 65 POKE56331,HH
EJ 70 M%=M/10:POKE56330,(M%*16+M-M%*10):POKE56329,0:POKE56328,0
PA 80 PRINTTT$:PRINTTAB(3);"USE CRSR KEYS TO MOVE HIGH LIGHT,{DOWN}"
SP 85 PRINT"Q TO QUIT/RESET, + - SHIFT TO SET TIMES {DOWN}"
GC 90 PRINTTAB(14);"{A}***** **{S}"
AM 100 PRINTTAB(14);"-00:00:00 A-"
HF 110 PRINTTAB(14);"{Z}***** **{X}"
FQ 120 PRINT"{A}*****{R}*****{R}*****{R}*****{S}"
RC 130 PRINT"- START *-TIME - {SPACE}STOP{2 SPACES}* - {4 SPACES}MEMO {5 SPACES}="
AC 140 PRINT"{Q}*****{R}*****+*****{R}*****+*****{W}"
RK 150 FORR=1TO9
ME 160 IF(RAND1)THENPRINT"-12:00A-X-00:00-12:00A-X-{13 SPACES}=:GOTO180
XC 170 PRINT"{Q}*****+*****+*****+*****+*****{W}"
MR 180 NEXT
GJ 190 PRINT"{Z}*****{E}*{E}* **{E}*****{E}*{E}*****{X}{DOWN}"
CG 200 PRINT"{2 SPACES}* X=OFF, F=FLASH, B=BELL AND F LASH"
DS 210 POKE650,128:SYS49365:POKE650,0
```

ALARMCLAC PROGRAM 2

```
C083:12 20 20 20 20 20 20 20 FD
C08B:20 20 20 20 20 20 5F 92 00 CE
C093:43 53 63 73 83 03 03 03 60
C09B:03 03 03 03 03 03 03 0A
C0A3:03 02 01 00 02 01 02 00 5F
C0AB:00 01 00 00 01 00 01 0C 83
C0B3:0E 10 12 14 01 08 0A 10 10
```




PROGRAMS

C0BB:17	19	42	01	01	46	01	00	8A	C203:A4	FD	C0	05	D0	02	A9	99	3E	C34B:BD	C0	48	C8	B9	BD	C0	48	06
C0C3:58	00	00	2B	2D	DB	DD	00	B8	C20B:20	D2	FF	BD	B2	C0	AA	A0	BF	C353:A4	FE	B9	CA	C0	A8	E0	04	3F
C0CB:03	06	09	0C	91	12	01	11	1A	C213:19	18	20	F0	FF	A4	FB	B9	82	C35B:D0	01	C8	68	99	2D	C0	68	96
C0D3:92	81	A2	4F	A0	3F	BD	43	09	C21B:93	C0	A0	C0	20	1E	A6	A6	32	C363:99	1E	C0	4C	2E	C2	A0	03	DC
C0DB:C0	99	43	C0	CA	88	10	F6	28	C223:FB	E8	E0	05	90	D2	60	A9	87	C36B:D9	C6	C0	F0	04	88	10	F8	14
C0E3:A9	00	A2	3C	9D	00	C0	CA	8B	C22B:9A	D0	02	A9	99	48	A6	FE	47	C373:60	84	FB	BD	A2	C0	85	FC	C7
C0EB:10	FA	A9	12	A2	00	9D	0F	E9	C233:BD	B2	C0	AA	A4	FD	B9	B7	4F	C37B:8D	3C	C0	20	D2	C3	A4	FE	E0
C0F3:C0	E8	9D	0F	C0	E8	E8	E0	11	C23B:C0	A8	18	20	F0	FF	68	20	C8	C383:B9	98	C0	C5	FC	D0	03	B9	6D
C0FB:0F	90	F3	A2	18	9D	00	D4	DD	C243:D2	FF	A4	FE	A6	FD	E0	05	AA	C38B:9D	C0	AA	A8	B9	CA	C0	18	84
C103:CA	10	FA	A9	2A	8D	01	D4	48	C24B:D0	08	B9	93	C0	A0	C0	4C	02	C393:65	FC	A8	B9	A6	C0	85	FC	FD
C10B:A9	F7	8D	06	D4	A9	0F	8D	6C	C253:1E	AB	A4	FE	B9	CA	C0	A8	7A	C39B:E0	01	D0	06	A5	FB	49	01	FE
C113:18	D4	A9	01	8D	3E	C0	A9	AD	C25B:E0	01	F0	05	E0	04	D0	16	CE	C3A3:85	FB	A4	FE	B9	98	C0	CD	F0
C11B:00	8D	3D	C0	85	FE	85	FD	E6	C263:C8	B9	2D	C0	D0	08	B9	1E	A5	C3AB:3C	C0	F0	09	99	9D	C0	AD	A2
C123:20	2E	C2	20	34	C1	20	86	0C	C26B:C0	D0	06	A9	D8	2C	A9	C2	6E	C3B3:3C	C0	99	98	C0	20	D2	C3	36
C12B:C1	20	A2	C2	C9	FF	D0	F3	FB	C273:2C	A9	C6	4C	D2	FF	E0	02	71	C3BB:A6	FD	8E	3C	C0	A6	FC	BD	04
C133:60	A0	03	B9	08	DC	99	3F	31	C27B:D0	10	C8	C8	B9	0F	C0	29	C7	C3C3:A2	C0	85	FD	20	2A	C2	AE	3B
C13B:C0	88	10	F7	18	A2	07	A0	BC	C283:7F	20	74	C1	B9	00	C0	4C	17	C3CB:3C	C0	86	FD	4C	2E	C2	A4	97
C143:0F	20	F0	FF	A9	9A	20	D2	3F	C28B:6D	C1	E0	03	D0	01	C8	20	C0	C3D3:FE	B9	CA	C0	18	65	FC	A8	A7
C14B:FF	AD	42	C0	29	7F	20	74	8A	C293:7F	C2	B9	0F	C0	30	03	A9	28	C3DB:F8	A6	FB	F0	7F	CA	F0	69	8A
C153:C1	AD	41	C0	20	6D	C1	AD	3F	C29B:C1	2C	A9	D0	4C	D2	FF	20	1D	C3E3:CA	F0	31	B9	0F	C0	A6	FC	94
C15B:40	C0	20	6D	C1	AD	42	C0	14	C2A3:E4	FF	D0	01	60	C9	11	D0	E2	C3EB:E0	02	F0	1E	A2	05	DD	CF	19
C163:30	03	A9	C1	2C	A9	D0	4C	07	C2AB:11	20	2A	C2	A6	FE	E8	E0	17	C3F3:C0	F0	10	CA	E0	03	D0	01	7C
C16B:D2	FF	48	A9	3A	20	D2	FF	F3	C2B3:05	90	02	A2	00	86	FE	4C	AE	C3FB:CA	E0	00	D0	F1	38	E9	01	73
C173:68	48	4A	4A	4A	4A	09	30	E8	C2BB:2E	C2	C9	1D	D0	11	20	2A	49	C403:4C	47	C4	CA	BD	CF	C0	4C	C4
C17B:20	D2	FF	68	29	0F	09	30	12	C2C3:C2	A6	FD	E8	E0	06	90	02	E4	C40B:47	C4	38	E9	01	10	35	A9	6B
C183:4C	D2	FF	AE	3D	C0	E8	8E	1A	C2CB:A2	00	86	FD	4C	2E	C2	C9	BD	C413:23	4C	47	C4	B9	0F	C0	A6	A8
C18B:3D	C0	E0	2D	B0	01	60	A9	C0	C2D3:91	D0	0F	20	2A	C2	A6	FE	E2	C41B:FC	E0	02	F0	1E	A2	00	DD	04
C193:00	8D	3D	C0	AD	3E	C0	49	5F	C2DB:CA	10	02	A2	04	86	FE	4C	B9	C423:CF	C0	F0	10	E8	E0	02	D0	83
C19B:01	8D	3E	C0	A0	00	A2	00	21	C2E3:2E	C2	C9	9D	D0	0F	20	2A	71	C42B:01	E8	E0	05	D0	F1	18	69	C3
C1A3:86	FC	A9	00	85	FB	BD	0F	85	C2EB:C2	A6	FD	CA	10	02	A2	05	BB	C433:01	4C	47	C4	E8	BD	CF	C0	24
C1AB:C0	CD	42	C0	D0	16	BD	00	B1	C2F3:86	FD	4C	2E	C2	A6	FD	E0	36	C43B:4C	47	C4	18	69	01	C9	24	DD
C1B3:C0	CD	41	C0	D0	0E	BD	1E	97	C2FB:05	D0	2D	C9	20	90	08	C9	97	C443:D0	02	A9	00	99	0F	C0	D8	4E
C1BB:C0	F0	09	85	FB	BD	2D	C0	47	C303:81	90	05	C9	A0	B0	01	60	D6	C44B:60	B9	00	C0	D0	08	A9	59	D2
C1C3:F0	02	85	FC	E8	AD	3D	C0	F9	C30B:48	A4	FE	B9	93	C0	85	FB	02	C453:99	00	C0	4C	E6	C3	38	E9	27
C1CB:49	01	8D	3D	C0	D0	D7	A5	58	C313:A9	C0	85	FC	A0	02	B1	FB	8C	C45B:01	4C	71	C4	B9	00	C0	C9	0C
C1D3:FB	F0	08	AD	3E	C0	F0	03	47	C31B:88	91	FB	C8	C8	C0	0D	90	4B	C463:59	D0	08	A9	00	99	00	C0	90
C1DB:A9	12	2C	A9	92	99	43	C0	1B	C323:F5	88	68	91	FB	4C	2E	C2	1E	C46B:4C	17	C4	18	69	01	99	00	7D
C1E3:18	98	69	10	A8	E8	E0	0E	80	C32B:C9	51	D0	03	A9	FF	60	E0	25	C473:C0	D8	60	00	00	00	00	00	9F
C1EB:90	B8	A5	FC	F0	05	AD	3E	9F	C333:04	F0	04	E0	01	D0	2F	A0	D1									
C1F3:C0	09	10	8D	04	D4	A2	00	AD	C33B:00	D9	BD	C0	F0	08	C8	C8	FE									
C1FB:86	FB	A9	9A	E4	FE	D0	08	6D	C343:C8	C0	09	90	F4	60	C8	B9	FD									

M I L T O N J O H N S O N

Word Find 3D is a word puzzle-generator capable of creating two- and three-dimensional puzzles. These puzzles print the words horizontally, vertically and diagonally, hiding them within a matrix of random letters. They're in plain sight, but they're hard to spot.

Depending on the level of difficulty you select, *Word Find 3D* can handle between 15 and 150 words, with words up to 15 characters in length. You've probably seen this kind of puzzle in books or magazines.

At level 1 the program creates a puzzle 20 columns wide by 20 rows high and can handle up to 15 words. At this level words are stored in one of eight directions: up, down, left, right, and diagonally up and to the right, down and to the right, up and to the left, and down and to the left.

At level 2 you can create a three-dimensional puzzle consisting of ten separate 20 x 20 puzzle layers. The ten separate layers are stacked one on

WORD FIND 3D

GENERATE WORD
PUZZLES WITH THIS
OUTSTANDING
PROGRAM FOR
THE 64

top of each other like a layer cake, with layer 1 on top and layer 10 on the bottom. Up to 150 words may be en-

tered. They'll be scattered across the ten layers in the eight directions mentioned above.

On level 3 the program creates a ten-layer puzzle similar to that on level 2, and it, too, can handle up to 150 words. Things get really tough here. Level 3 words are placed in the basic eight directions mentioned above plus two more directions, ascending and descending.

Words that are stored in the ascending direction start at a lower layer and work their way to an upper layer. For example, if the word *cake* were entered in an ascending direction on layer 10 (the bottom layer) with the letter *C* at column A, row A, then the letter *A* would be found at column A, row A on the next layer up (layer 9), and so on.

The descending direction is just the opposite; words start at an upper layer and work their way straight down. In all levels, the direction of each word is chosen randomly.

PROGRAMS

Getting Started

Word Find 3D is written entirely in machine language, but it loads and runs like a BASIC program. Enter the program with *MLX*, our machine language entry program; see "Typing Aids" elsewhere in this section. When *MLX* prompts you, respond with the values given below.

Starting address: 0801

Ending address: 1900

Be sure to save a copy of the program before exiting *MLX*.

When the program begins, the opening screen appears with the three difficulty levels explained. Select a difficulty level by pressing 1, 2, or 3. You'll then be prompted to enter a word. At this prompt, type in a word up to 15 letters in length, ending with a return. Words may contain only the letters A-Z, with no spaces or punctuation marks.

When you've entered all the words you want, press the Return key again. At this point, the screen will blank briefly while your puzzle is being generated.

Starting to Play

After your puzzle has been created, you'll be presented with the main screen. On the bottom two lines, you'll find the status of your puzzle, indicating the number of words you've entered, the number of words you've found, the current layer of the puzzle you're viewing, and the difficulty level you've chosen.

In the upper left corner of the screen, you'll see a list of eight options. More about these later.

In the upper right portion of the screen, you'll see a 20 x 20 matrix of letters in black. Surrounding this matrix will be the letters A-T in blue. These letters indicate the columns (across) and rows (down) and are used to solve the puzzle when you locate hidden words.

About Those Options

Access the first option, Print, by pressing P. This will send to the printer all ten layers of the puzzle followed by a complete list of the words you've entered. This listing will take two sheets of paper. Make sure your printer is on before you start to print. A number will be printed after each word. This

number indicates in which layer the word appears in the puzzle. Each layer is also numbered. *Word Find 3D* will always print a ten-layer puzzle, even on difficulty 1.

The second option, Give Up, may be accessed by pressing G. You'll be prompted to press G again if you really want the program to solve the puzzle for you. All the words in the puzzle will then be highlighted.

The third option, Help, may be accessed by pressing H. This prints a list of all the words that can be found on the current puzzle layer.

Press U to move up a layer. This option only works on levels 2 and 3 and is used to move up from a lower layer to an upper layer. For example, if you were currently on layer 6 and you pressed U, layer 5 would appear on the screen.

The fifth option, Layer Down, may be accessed by pressing D. This option moves you down a layer.

Access the sixth option, Solve Word, by pressing the S key. Use this option when you've located a hidden word. You'll be asked to enter the starting row of the word you've found. This is the letter on the right side of the puzzle. You'll then be asked to enter the starting column of the word. This is found at the bottom of the puzzle. If you're correct, the word will be highlighted in the puzzle. Also, words found in the status section will be incremented by 1. If you were not correct, the program will inform you. Press any key to continue.

The seventh option, Restart, may be accessed by pressing R. Use this to start the program over.

The last option, Quit, may be accessed by pressing Q. This option will reset the computer.

WORD FIND 3D

```
0801:0B 08 0A 00 9E 32 30 36 2E
0809:31 00 00 00 4C 6A 0A 9 7B
0811:80 85 FE A9 00 85 FD 85 D4
0819:83 85 74 85 79 A8 91 FD C2
0821:C8 D0 FB E6 FE A6 FE E0 29
0829:A0 F0 02 D0 F1 60 A0 00 65
0831:84 7A 20 E4 FF A4 7A C9 C5
0839:00 F0 F7 C9 0D F0 1B C9 4D
0841:14 F0 1A C9 41 30 EB C9 E3
0849:5B A4 7A 91 B4 20 D2 FF 64
0851:C8 84 7A C0 0F F0 03 4C D0
0859:33 08 84 7A 60 A4 7A C0 88
0861:00 F0 08 88 20 D2 FF A9 2D
0869:00 91 B4 84 7A 4C 33 08 30
0871:A9 00 85 B4 A9 80 85 B5 62
0879:A9 F8 85 FD A9 8E 85 FE BE
0881:A2 18 A0 26 18 20 F0 FF 82
```

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0889:A9 C2 85 C3 A9 08 85 C4 49
0891:20 79 12 20 2F 08 C0 00 6F
0899:F0 26 98 A0 00 91 FD E6 F1
08A1:74 A5 74 C5 86 F0 19 A5 10
08A9:B4 18 69 10 85 B4 90 02 6A
08B1:E6 B5 A5 FD 18 69 01 85 25
08B9:FD 90 02 E6 FE 4C 89 08 DF
08C1:60 FE 30 14 0D 45 4E 54 77
08C9:45 52 20 41 20 57 4F 52 78
08D1:44 20 2D 3E 20 00 93 8E 4C
08D9:08 90 FF 10 D7 58 4F C6 98
08E1:58 4F 58 4F 0D FF 10 58 D2
08E9:CF 58 C9 58 4F B3 C4 0D 96
08F1:FF 10 58 4F D2 CE 58 4F D7
08F9:58 4F 0D FF 10 58 4F 58 84
0901:C4 58 4F 58 4F 0D FF 10 B9
0909:58 4F 58 4F 58 4F C2 4F EF
0911:0D FF 10 58 4F 58 4F 58 04
0919:D9 58 4F 0D FF 10 58 4F 29
0921:58 4F 58 4F 58 CA 0D FF 3B
0929:10 58 4F 58 4F 58 4F 58 9B
0931:CF 0D FF 10 58 4F 58 4F 6F
0939:58 4F 58 C8 0D FF 10 58 C3
0941:4F CD C9 CD 04 FF CE 0D 05
0949:FF 10 58 4F 58 4F 58 4F 5F
0951:58 D3 0D FF 10 58 4F 58 FE
0959:4F 58 4F 58 CF 0D FF 10 5B
0961:58 4F 58 4F 58 4F 58 CE F2
0969:0D 0D FF 0B 1E 44 49 46 D0
0971:46 49 43 55 4C 54 59 20 3D
0979:4C 45 56 45 4C 53 0D FF EB
0981:12 1F 4C 45 56 45 4C 20 C2
0989:31 0D 1E 55 53 45 20 4F CF
0991:4E 4C 59 20 54 48 45 20 79
0999:54 4F 50 20 4C 41 59 45 15
09A1:52 20 4F 46 20 54 48 45 5B
09A9:20 50 55 5A 5A 4C 45 0D CB
09B1:FF 0A 28 4D 41 58 20 31 FC
09B9:35 20 57 4F 52 44 53 29 C1
09C1:0D FF 12 1F 4C 45 56 45 F7
09C9:4C 20 32 0D 1E 55 53 45 53
09D1:20 41 4C 4C 20 54 45 4E BD
09D9:20 4C 41 59 45 52 53 20 07
09E1:42 55 54 20 4B 45 45 50 41
09E9:20 45 41 43 48 20 57 4F 7A
09F1:52 44 0D 20 4F 4E 20 4F 25
09F9:4E 45 20 4C 41 59 45 52 99
0A01:0D FF 12 1F 4C 45 56 45 39
0A09:4C 20 33 0D 1E 55 53 45 B4
0A11:20 41 4C 4C 20 54 45 4E FE
0A19:20 4C 41 59 45 52 53 20 48
0A21:41 4E 44 20 41 4C 4C 4F 17
0A29:57 20 57 4F 52 44 53 0D 28
0A31:20 54 4F 20 41 53 43 45 79
0A39:4E 44 20 41 4E 44 20 4A 5
0A41:45 53 43 45 4E 44 0D 1F 46
0A49:50 4C 45 41 53 45 20 53 98
0A51:45 4C 45 43 54 20 41 20 BD
0A59:4C 45 56 45 4C 00 A9 D7 91
0A61:85 C3 A9 08 85 C4 4C 79 30
0A69:12 20 10 08 A9 5B 8D 11 F7
0A71:D0 A9 01 85 84 8D 20 D0 3C
0A79:A9 0F 8D 21 D0 A9 0E 8D C0
0A81:23 D0 A9 FF 8D 06 DD A9 7A
0A89:01 8D 0F DD 20 5F 0A 20 F3
0A91:E4 FF C9 00 F0 F9 38 E9 1B
0A99:30 C9 01 30 F2 C9 04 10 32
0AA1:EE 85 73 C9 01 F0 07 A9 1D
0AA9:96 85 86 4C B3 0A A9 0F 28
0AB1:85 86 A9 F0 85 C3 A9 0A 07
0AB9:85 C4 20 79 12 20 71 08 98
0AC1:20 DE 0C A5 73 C9 03 30 72
0AC9:07 A9 0B 85 85 4C D5 0A 98
0AD1:A9 09 85 85 20 9E 0C 20 B9
0AD9:F4 0C 20 1B 13 20 2B 0C 9C
0AE1:A9 0F 8D 21 D0 20 E9 0C 39
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PROGRAMS

0AE9:A9	FF 85 83 4C 9A 13 FE AD	0D51:AC	0E C9 04 D0 03 4C 26 10	0FB9:76	20 7B 0C 91 AA 20 E4 A7
0AF1:78	14 FE 50 14 FE 50 14 7D	0D59:0F	C9 05 D0 03 4C 9C 0F AC	0FC1:12	A0 00 B1 B4 F0 03 4C E7
0AF9:FE	50 14 FE 50 14 0D 00 01	0D61:C9	06 D0 03 4C 17 10 C9 D4	0FC9:2F	0D C6 7F F0 0E A5 B4 53
0B01:13	1F 57 4F 52 44 20 46 72	0D69:07	D0 03 4C 8F 10 C9 08 B8	0FD1:38	E9 13 85 B4 B0 02 C6 74
0B09:49	4E 44 20 33 44 FF 1A A6	0D71:D0	03 4C 0F 11 C9 09 D0 C1	0FD9:B5	4C C2 0F A5 7C 85 B4 0E
0B11:41	0D 05 20 4F 50 54 49 5B	0D79:03	4C 7F 11 4C F8 11 E6 78	0FE1:A5	7D 85 B5 A0 00 84 7F CB
0B19:4F	4E 53 FF 1E 1F 42 0D D3	0D81:7A	CA D0 AA 60 84 7A C8 23	0FE9:A4	7F B1 B2 F0 20 48 A5 D9
0B21:05	50 20 1F 50 52 49 4E 70	0D89:A9	F0 85 B2 A9 7F 85 B3 9A	0FF1:83	F0 06 68 09 80 4C FB 34
0B29:54	FF 1F 43 0D 05 47 20 AC	0D91:18	A5 B2 69 10 85 B2 A5 AF	0FF9:0F	68 A0 00 91 B4 E6 7F 7A
0B31:1F	47 49 56 45 20 55 50 DC	0D99:B3	69 00 85 B3 88 D0 F0 92	1001:A5	B4 38 E9 13 85 B4 B0 8F
0B39:20	20 FF 1B 44 0D 05 48 C1	0DA1:A9	00 85 B4 A9 90 85 B5 DC	1009:2C	C6 B5 4C E9 0F A5 83 B1
0B41:20	1F 48 45 4C 50 FF 20 50	0DA9:A4	7A B1 F9 A8 88 F0 12 E5	1011:D0	03 4C 80 0D 60 20 86 9C
0B49:45	0D 05 55 20 1F 4C 41 92	0DB1:E6	B5 18 A5 B4 69 90 85 FB	1019:0D	A9 01 85 76 B1 FD 85 9E
0B51:59	45 52 20 55 50 FF 1C B9	0DB9:B4	A5 B5 69 00 85 B5 4C B2	1021:81	A9 15 38 E5 81 85 75 48
0B59:46	0D 05 44 20 1F 4C 41 12	0DC1:AE	0D A4 7A 60 20 86 0D 50	1029:20	7B 0C 91 A8 20 7B 0C 9B
0B61:59	45 52 20 44 4F 57 4E 1E	0DC9:B1	FD 85 76 A9 15 85 75 76	1031:91	AA 20 E4 12 A0 00 B1 DB
0B69:FF	1A 47 0D 05 53 20 1F 94	0DD1:20	7B 0C 91 A8 A9 01 85 E8	1039:B4	F0 03 4C 2F 0D C6 7F CF
0B71:53	4F 4C 56 45 20 57 4F 9C	0DD9:76	20 7B 0C 91 AA 20 E4 C3	1041:F0	10 A5 B4 18 69 15 85 F3
0B79:52	44 FF 1A 48 0D 05 52 3E	0DE1:12	A0 00 B1 B4 F0 03 4C 04	1049:B4	A5 B5 69 00 85 B5 4C 48
0B81:20	1F 52 45 53 54 41 52 CE	0DE9:2F	0D C6 7F F0 0E A5 B4 6F	1051:36	10 A5 7C 85 B4 A5 7D D4
0B89:54	FF 1D 49 05 52 05 51 CE	0DF1:38	E9 14 85 B4 B0 02 C6 B0	1059:85	B5 A0 00 84 7F A4 7F A8
0B91:20	1F 51 55 49 54 FF 20 BA	0DF9:B5	4C E2 0D A5 7C 85 B4 0E	1061:B1	B2 F0 22 48 A5 83 F0 18
0B99:4A	05 4F 1F FF 26 4B 05 26	0E01:A5	7D 85 B5 A0 00 84 7F E8	1069:06	68 09 80 4C 71 10 68 80
0BA1:57	1F FF 26 4C 05 53 1F C9	0E09:A4	7F B1 B2 F0 20 48 A5 F6	1071:A0	00 91 B4 E6 7F A5 B4 94
0BA9:FF	26 4D 0D FF 26 4E 0D 06	0E11:83	F0 06 68 09 80 4C 1B 70	1079:18	69 15 85 B4 A5 B5 69 0C
0BB1:FF	26 4F 0D FF 26 50 0D 52	0E19:0E	68 A0 00 91 B4 E6 7F 17	1081:00	85 B5 4C 5F 10 A5 83 88
0BB9:FF	26 51 0D FF 26 52 0D 9E	0E21:38	A5 B4 E9 14 85 B4 B0 C8	1089:D0	03 4C 80 0D 60 20 86 15
0BC1:FF	26 53 0D FF 26 54 0D EA	0E29:02	C6 B5 4C 09 0E A5 83 C2	1091:0D	A9 01 85 76 B1 FD 85 17
0BC9:FF	12 41 42 43 44 45 46 AC	0E31:D0	03 4C 80 0D 60 20 86 B8	1099:81	A9 15 38 E5 81 85 75 C0
0BD1:47	48 49 4A 4B 4C 4D 4E DF	0E39:0D	A9 01 85 76 A9 15 85 C8	10A1:20	7B 0C 91 A8 A9 15 85 E6
0BD9:4F	50 51 52 53 54 0D 05 06	0E41:75	20 7B 0C 91 A8 B1 FD 0E	10A9:75	B1 FD 85 76 20 7B 0C 04
0BE1:FF	18 43 4F 4C 55 4D 4E FB	0E49:85	7F A9 15 38 E5 7F 85 6C	10B1:91	AA 20 E4 12 A0 00 B1 5C
0BE9:53	0D FF 26 0D 20 57 4F 36	0E51:75	20 7B 0C 91 AA 20 E4 BC	10B9:B4	F0 03 4C 2F 0D C6 7F 50
0BF1:52	44 53 20 45 4E 54 45 FF	0E59:12	A0 00 B1 B4 F0 03 4C 7D	10C1:F0	10 A5 B4 18 69 13 85 70
0BF9:52	45 44 FF 05 57 4F 52 89	0E61:2F	0D C6 7F F0 09 E6 B4 57	10C9:B4	A5 B5 69 00 85 B5 4C C8
0C01:44	53 20 46 4F 55 4E 44 29	0E69:D0	02 E6 B5 4C 5A 0E A5 34	10D1:B6	10 A5 7C 85 B4 A5 7D 95
0C09:0D	20 43 55 52 52 45 4E 22	0E71:7C	85 B4 A5 7D 85 B5 A0 2C	10D9:85	B5 A0 00 84 7F A4 7F 29
0C11:54	20 4C 41 59 45 52 FF 7D	0E79:00	84 7F A4 7F B1 B2 F0 0A	10E1:B1	B2 F0 22 48 A5 83 F0 98
0C19:05	44 49 46 46 49 43 55 85	0E81:22	48 A5 83 F0 06 68 09 27	10E9:06	68 09 80 4C F1 10 68 03
0C21:4C	54 59 20 4C 45 56 45 0B	0E89:80	4C 8E 0E 68 A0 00 91 03	10F1:A0	00 91 B4 E6 7F A5 B4 15
0C29:4C	00 A9 01 85 C3 A9 0B 46	0E91:B4	E6 7F A5 B4 18 69 01 E5	10F9:18	69 13 85 B4 A5 B5 69 4C
0C31:85	C4 20 79 12 A9 1F 20 6E	0E99:85	B4 A5 B5 69 00 85 B5 C1	1101:00	85 B5 4C DF 10 A5 83 0E
0C39:D2	FF 18 A2 17 A0 0F 20 61	0EAL:4C	7C 0E A5 83 D0 03 4C D0	1109:D0	03 4C 80 0D 60 20 86 96
0C41:F0	FF A9 00 A6 74 20 CD 1C	0EA9:80	0D 60 20 86 0D B1 FD 21	1111:0D	B1 FD 18 69 01 85 76 38
0C49:BD	A2 17 A0 1F 18 20 F0 60	0EB1:85	7F A9 15 38 E5 7F 85 D4	1119:A9	15 85 75 20 7B 0C 91 F5
0C51:FF	A9 00 A6 79 20 CD BD E3	0EB9:75	A9 01 85 76 20 7B 0C AA	1121:A8	20 7B 0C 91 AA 20 E4 2C
0C59:A2	18 A0 0F 18 20 F0 FF F0	0EC1:91	A8 A9 15 85 75 20 7B 15	1129:12	A0 00 B1 B4 F0 03 4C 53
0C61:A9	00 A6 84 20 CD BD E2 C1	0EC9:0C	91 AA 20 E4 12 A0 00 58	1131:2F	0D C6 7F B0 0E A5 B4 BE
0C69:18	A0 24 18 20 F0 FF A9 2A	0ED1:B1	B4 F0 03 4C 2F 0D C6 42	1139:38	E9 15 85 B4 B0 02 C6 20
0C71:00	A6 73 20 CD BD 20 44 8D	0ED9:7F	F0 0E A5 B4 18 69 14 FA	1141:B5	4C 2A 11 A5 7C 85 B4 86
0C79:13	60 38 AD 06 D0 85 A2 6A	0EE1:85	B4 90 02 E6 B5 4C CF 96	1149:A5	7D 85 B5 A0 00 84 7F 37
0C81:A5	78 65 77 85 78 A5 A2 AA	0EE9:0E	A5 7C 85 B4 A5 7D 85 1B	1151:A4	7F B1 B2 F0 20 48 A5 45
0C89:C5	76 30 07 C5 75 10 03 BF	0EF1:B5	A0 00 84 7F A4 7F B1 98	1159:83	F0 06 68 09 80 4C 63 07
0C91:85	77 60 E6 78 69 05 38 70	0EF9:B2	F0 22 48 A5 83 F0 06 97	1161:11	68 A0 00 91 B4 E6 7F E6
0C99:E5	78 4C 89 0C A9 A0 85 B2	0F01:68	09 80 4C 08 0F 68 A0 58	1169:A5	B4 38 E9 15 85 B4 B0 0A
0CA1:F0	A9 8C 85 FA A6 74 A0 07	0F09:00	91 B4 E6 7F A5 B4 18 A4	1171:02	C6 B5 4C 51 11 A5 83 5F
0CA9:00	A5 73 C9 01 D0 0A A9 3F	0F11:69	14 85 B4 A5 B5 69 00 BB	1179:D0	03 4C 80 0D 60 20 86 07
0CB1:01	91 F9 C8 CA F0 25 D0 AF	0F19:85	B5 4C F6 0E A5 83 D0 3F	1181:0D	A9 01 85 76 A9 15 85 17
0CB9:F8	A9 01 85 76 A9 0B 85 27	0F21:03	4C 80 0D 60 20 86 0D 52	1189:75	20 7B 0C 91 A8 20 7B 89
0CC1:75	20 7B 0C A0 00 A6 74 93	0F29:A9	01 85 76 A9 15 85 75 96	1191:0C	91 AA 20 E4 12 A4 7A A8
0CC9:A5	77 91 F9 E6 77 A5 77 3C	0F31:20	7B 0C 91 A8 A4 7A B1 57	1199:B1	FD C5 84 10 06 A0 00 EE
0CD1:C9	0B 30 04 A9 01 85 77 AB	0F39:FD	18 69 01 85 76 20 7B 5B	11A1:B1	B4 F0 03 4C 2F 0D C6 18
0CD9:C8	CA D0 EC 60 A9 01 8D 2B	0F41:0C	91 AA 20 E4 12 A0 00 D1	11A9:7F	F0 10 C6 B5 A5 0D 38 1C
0CE1:30	D0 A9 0B 8D 11 D0 60 DB	0F49:B1	B4 F0 03 4C 2F 0D C6 BB	11B1:E9	90 85 B4 B0 02 C6 B5 B9
0CE9:A9	00 8D 30 D0 A9 5B 8D FC	0F51:7F	F0 0E A5 B4 38 E9 01 E2	11B9:4C	9F 11 A5 7C 85 B4 A5 6F
0CF1:11	D0 60 A9 A0 85 F9 A9 26	0F59:85	B4 B0 02 C6 B5 4C 47 8A	11C1:7D	85 B5 A0 00 84 7F A4 7A
0CF9:8C	85 FA A9 36 85 FB A9 1D	0F61:0F	A5 7C 85 B4 A5 7D 85 15	11C9:7F	B1 B2 F0 22 48 A5 83 7E
0D01:8D	85 FC A9 F8 85 FD A9 01	0F69:B5	A0 00 84 7F A4 7F B1 12	11D1:F0	06 68 09 80 4C DA 11 87
0D09:8E	85 FE A9 CC 85 AD A9 BD	0F71:B2	F0 20 48 A5 83 F0 06 D0	11D9:68	A0 00 91 B4 E6 7F C6 78
0D11:8D	85 A9 A9 62 85 AA A9 4B	0F79:68	09 80 4C 80 F6 68 A0 94	11E1:B5	A5 B4 38 E9 90 85 B4 B3
0D19:8E	85 AB A9 0A 85 2D A9 56	0F81:00	91 B4 E6 7F A5 B4 38 3D	11E9:B0	02 C6 B5 4C C8 11 A5 66
0D21:8C	85 2E A0 00 84 7A A5 5F	0F89:E9	01 85 B4 B0 02 C6 B5 A9	11F1:83	D0 03 4C 80 0D 60 20 48
0D29:83	F0 01 60 A6 74 A5 85 3F	0F91:4C	6E 0F A5 83 D0 03 4C 5F	11F9:86	0D A9 01 85 76 A9 15 56
0D31:85	75 A9 01 85 76 20 7B 72	0F99:80	0D 60 20 86 0D B1 FD 13	1201:85	75 20 7B 0C 91 A8 20 1D
0D39:0C	A4 7A 91 FB C9 01 D0 C4	0FA1:18	69 01 85 76 A9 15 85 A8	1209:7B	0C 91 AA 20 E4 12 A9 2D
0D41:03	4C C6 0D C9 02 D0 03 94	0FA9:75	20 7B 0C 91 A8 A9 15 52	1211:0A	E5 84 85 81 A4 7A E6 17
0D49:4C	37 0E C9 03 D0 03 4C 63	0FB1:38	E5 76 85 75 A9 01 85 66	1219:81	B1 FD C5 81 10 06 A0 7F

PROGRAMS

1221:00	B1	B4	F0	03	4C	2F	0D	0C	1489:31	85	C3	A9	15	85	C4	20	27	16F1:20	FF	16	A4	7A	A9	01	91	49
1229:C6	7F	F0	10	E6	B5	A5	B4	BD	1491:79	12	A2	00	BD	4E	15	95	36	16F9:2D	E6	79	4C	B1	16	A4	7A	14
1231:18	69	90	85	B4	90	02	E6	F8	1499:F9	E8	E0	06	D0	F6	20	1C	34	1701:B1	FB	C9	01	D0	03	4C	FD	79
1239:B5	4C	20	12	A5	7C	85	B4	4F	14A1:18	A9	0D	20	D2	FF	20	A3	5E	1709:0D	C9	02	D0	03	4C	70	0E	B5
1241:A5	7D	85	B5	A0	00	84	7F	31	14A9:18	A9	0D	20	D2	FF	20	E7	AA	1711:C9	03	D0	03	4C	EA	0E	C9	23
1249:A4	7F	B1	B2	F0	22	48	A5	47	14B1:FF	20	CC	FF	4C	16	18	13	79	1719:04	D0	03	4C	62	0F	C9	05	8A
1251:83	F0	06	68	09	80	4C	5B	F8	14B9:FE	16	11	1C	43	48	45	43	D3	1721:D0	03	4C	DD	0F	C9	06	D0	5C
1259:12	68	A0	00	91	B4	E6	7F	61	14C1:4B	20	50	52	49	4E	54	45	38	1729:03	4C	53	10	C9	07	D0	03	66
1261:E6	B5	A5	B4	18	69	90	85	73	14C9:52	2C	50	52	45	53	53	20	93	1731:4C	D3	10	C9	08	D0	03	4C	EE
1269:B4	90	02	E6	B5	4C	49	12	3E	14D1:50	20	54	4F	20	50	52	49	D9	1739:45	11	C9	09	D0	03	4C	BC	FF
1271:A5	83	D0	03	4C	80	0D	60	72	14D9:4E	54	00	4C	41	59	45	52	4F	1741:11	4C	3D	12	60	13	FE	16	37
1279:A9	01	85	82	8A	48	A0	00	42	14E1:20	31	30	FF	16	4C	41	59	2A	1749:11	1C	45	4E	54	45	52	20	11
1281:B1	C3	F0	1D	C9	FF	F0	1C	AB	14E9:45	52	20	39	FF	17	4C	41	17	1751:53	54	41	52	54	49	4E	47	37
1289:C9	FE	F0	37	20	D2	FF	18	48	14F1:59	45	52	20	38	0D	00	FF	5A	1759:20	52	4F	57	20	28	41	2D	DC
1291:A5	C3	69	01	85	C3	A5	C4	02	14F9:0A	00	4C	41	59	45	52	20	69	1761:54	29	20	00	13	FE	16	11	D9
1299:69	00	85	C4	E6	82	4C	7F	C8	1501:37	FF	17	4C	41	59	45	52	BA	1769:45	4E	54	45	52	20	53	54	BA
12A1:12	68	AA	60	C8	B1	C3	AA	83	1509:20	36	FF	17	4C	41	59	45	A1	1771:41	52	54	49	4E	47	20	43	07
12A9:A9	20	20	D2	FF	CA	F0	03	EB	1511:52	20	35	0D	00	4C	41	59	F0	1779:4F	4C	55	4D	4E	20	28	41	66
12B1:4C	AB	12	A5	C3	18	69	02	D6	1519:45	52	20	34	FF	17	4C	41	F7	1781:2D	54	29	20	00	13	FE	16	E2
12B9:85	C3	A5	C4	69	00	85	C4	AD	1521:59	45	52	20	33	FF	17	4C	A9	1789:11	4E	4F	20	4D	41	54	43	1B
12C1:4C	7F	12	C8	B1	C3	AA	C8	75	1529:41	59	45	52	20	32	0D	00	FB	1791:48	20	20	20	20	20	50	52	66
12C9:B1	C3	20	D2	FF	CA	F0	03	F8	1531:FF	1E	4C	41	59	45	52	20	25	1799:45	53	53	20	41	4E	59	20	C1
12D1:4C	C9	12	A5	C3	18	69	03	7F	1539:31	00	00	10	9E	80	9C	F0	61	17A1:4B	45	59	20	54	4F	20	43	57
12D9:85	C3	A5	C4	69	00	85	C4	CD	1541:9A	60	99	D0	97	40	96	B0	AC	17A9:4F	4E	54	49	4E	55	45	00	84
12E1:4C	7F	12	A4	7A	B1	AA	A8	2D	1549:94	20	93	90	91	00	20	00	0E	17B1:A9	CD	85	C3	A9	17	85	C4	8E
12E9:88	F0	10	18	A5	B4	69	14	F8	1551:90	00	20	A9	8C	85	C3	A9	0E	17B9:20	79	12	20	E4	FF	C9	00	55
12F1:85	B4	A5	B5	69	00	85	B5	22	1559:15	85	C4	20	79	12	20	E4	43	17C1:F0	F9	C9	52	D0	03	4C	6A	DA
12F9:4C	E9	12	A4	7A	B1	AA	38	73	1561:FF	C9	00	F0	F9	C9	47	F0	83	17C9:0A	4C	16	18	13	FE	16	11	26
1301:E9	01	18	65	B4	85	B4	A5	80	1569:03	4C	16	18	20	F4	0C	84	DD	17D1:1C	50	52	45	53	53	20	52	3B
1309:B5	69	00	85	B5	A5	B4	85	EF	1571:7A	B1	2D	D0	09	20	86	0D	DA	17D9:20	54	4F	20	52	45	53	54	BB
1311:7C	A5	B5	85	7D	B1	FD	85	22	1579:20	E4	12	20	FF	16	A4	7A	4D	17E1:41	52	54	00	A9	01	85	C3	EF
1319:7F	60	A9	41	85	76	A9	5B	15	1581:A9	01	91	2D	C8	C4	74	D0	D8	17E9:A9	18	85	C4	20	79	12	20	1B
1321:85	75	A9	00	85	B4	A9	90	7F	1589:E6	F0	DE	13	FE	16	11	1C	FE	17F1:E4	FF	C9	00	F0	F9	C9	51	20
1329:85	B5	A0	00	20	7B	0C	B1	4C	1591:50	52	45	53	53	20	47	20	20	17F9:D0	03	4C	E2	FC	4C	16	18	66
1331:B4	D0	04	A5	77	91	B4	C8	F4	1599:54	4F	20	47	49	56	45	20	88	1801:13	FE	16	11	1C	50	52	45	5A
1339:D0	F2	E6	B5	A5	B5	C9	A0	F4	15A1:55	50	00	A9	A0	85	F9	A9	DD	1809:53	53	20	51	20	54	4F	20	E1
1341:D0	EA	60	4C	74	13	A2	00	90	15A9:8C	85	FA	A0	00	84	7A	A9	95	1811:51	55	49	54	00	20	20	0C	90
1349:86	7C	A6	7C	E0	14	10	22	08	15B1:01	85	C3	A9	16	85	C4	20	41	1819:4C	9A	13	A2	00	A0	00	B1	D6
1351:A0	12	18	20	F0	FF	A0	00	1A	15B9:79	12	A4	7A	B1	F9	C5	84	E6	1821:F9	20	87	18	C8	C0	14	D0	0B
1359:B1	C3	20	D2	FF	C8	C0	14	33	15C1:D0	21	20	86	0D	A5	B2	85	F2	1829:F6	A9	F8	85	C3	A9	14	85	29
1361:30	F6	E6	7C	A5	C3	18	69	D7	15C9:C3	A5	B3	85	C4	20	79	12	B9	1831:C4	20	79	12	A0	00	B1	FB	80
1369:14	85	C3	90	02	E6	C4	4C	FD	15D1:C6	82	A5	82	F0	08	A9	9D	75	1839:20	87	18	C8	C0	14	D0	F6	D9
1371:4B	13	60	A5	84	8D	20	D0	D3	15D9:20	D2	FF	4C	D1	15	A9	11	D4	1841:A9	F8	85	C3	A9	14	85	C4	DE
1379:AA	A9	70	85	C3	A9	8E	85	2D	15E1:20	D2	FF	E6	7A	A5	7A	C5	64	1849:20	79	12	A0	00	B1	FD	20	17
1381:4C	A9	90	20	D2	FF	E6	C4	B1	15E9:74	D0	CF	A9	3C	85	C3	A9	40	1851:87	18	C8	C0	14	D0	F6	E8	2B
1389:A5	C3	18	69	90	85	C3	90	BF	15F1:16	85	C4	20	79	12	20	E4	5C	1859:E0	14	D0	06	A9	0D	20	D2	0E
1391:02	E6	C4	CA	D0	F0	4C	47	E1	15F9:FF	C9	00	F0	F9	4C	16	18	EA	1861:FF	60	A5	F9	18	69	14	85	12
1399:13	20	E4	FF	C9	00	F0	F9	18	1601:13	05	11	FF	06	48	45	4C	42	1869:F9	90	02	E6	FA	A5	FB	18	E7
13A1:C9	41	30	F5	C9	56	10	F1	1C	1609:50	0D	FF	11	FE	11	9D	11	3A	1871:69	14	85	FB	90	02	E6	FC	23
13A9:38	E9	40	C9	10	D0	03	4C	21	1611:FF	11	FE	11	9D	11	FE	11	B4	1879:A5	FD	18	69	14	85	FD	90	D8
13B1:E7	13	C9	07	D0	03	4C	54	B9	1619:FE	11	9D	11	FE	11	FE	11	21	1881:02	E6	FE	4C	1E	18	48	29	1C
13B9:15	C9	08	D0	03	4C	A4	15	92	1621:9D	11	FF	11	FE	11	9D	11	F9	1889:80	F0	05	A9	12	20	D2	FF	28
13C1:C9	15	D0	03	4C	5B	16	C9	22	1629:FF	11	FE	11	9D	11	FF	11	CC	1891:68	48	29	7F	20	D2	FF	68	D9
13C9:04	D0	03	4C	66	16	C9	13	7D	1631:FE	11	9D	11	FE	11	FF	11	61	1899:29	80	F0	05	A9	92	20	D2	97
13D1:D0	03	4C	77	16	C9	12	D0	EE	1639:11	1F	00	13	FE	16	11	1C	75	18A1:FF	60	A0	00	84	7C	84	FB	19
13D9:03	4C	B1	17	C9	11	D0	03	73	1641:50	52	45	53	53	20	41	4E	F3	18A9:A9	80	85	FC	A9	A0	85	F9	24
13E1:4C	E5	17	4C	9A	13	A9	20	E3	1649:59	20	4B	45	59	20	54	4F	2B	18B1:A9	8C	85	FA	A4	7C	B1	F9	AE
13E9:85	FA	A0	00	84	F9	91	F9	CE	1651:20	43	4F	4E	54	49	4E	55	E6	18B9:D0	01	60	A0	00	B1	FB	D0	38
13F1:C8	D0	FB	E6	FA	A6	FA	E0	E7	1659:45	00	A5	84	C9	01	F0	02	5B	18C1:02	A9	2E	20	D2	FF	C8	C0	0E
13F9:22	D0	F3	A9	B8	85	C3	A9	8B	1661:C6	84	4C	16	18	A5	73	C9	05	18C9:0F	D0	F2	A9	28	20	D2	FF	16
1401:14	85	C4	20	79	12	20	E4	68	1669:01	F0	08	A5	84	C9	0A	10	1D	18D1:A4	7C	B1	F9	C9	0A	F0	08	A9
1409:FF	C9	00	F0	F9	C9	50	F0	3B	1671:02	E6	84	4C	16	18	20	F4	F3	18D9:4A	A9	00						



PROGRAMS

DAVID WILLIAMS

This popular pencil-and-paper game has been adapted several times for computers, but *Hangman 128* provides a few twists. It automatically keeps count of how many games you've won and how many the computer's won. You can easily update and increase its vocabulary, and it incorporates a large variety of background graphics that change with each game you play.

Typing It In

Hangman 128 is written entirely in BASIC 7. To avoid typing errors when entering the program, use *The Automatic Proofreader* (see "Typing Aids" elsewhere in this section). When you've finished typing in the program, be sure to save a copy of it.

Guess My Word

When you run the program, it picks a word at random from its vocabulary. An asterisk appears in the place of each letter in the word. Whenever you guess a correct letter, that letter takes the place of the asterisk representing it. Guess all the correct letters, and the complete word appears along with a message from the computer asking if you'd like to play again.

If you guess an incorrect letter, the hangman's gallows appears. Continue to guess incorrectly, and parts of the unfortunate victim appear. After eight incorrect guesses, you lose the game. When you've had enough, the computer announces how many games it won and how many times you cheated the hangman.

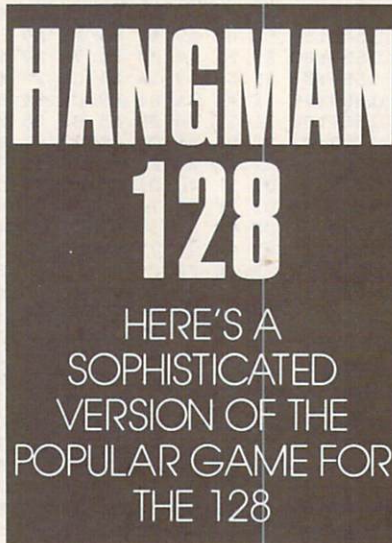
The program puts its more than 400 words into an array and selects them at random for each game. The program is dimensioned for 500 words (see DIMB\$ in line 20), but you can use more if you like. Simply increase this figure to a number higher than the actual number of words in your vocabulary. Continue to add words as DATA statements. Just be sure that your last piece of data is -999-.

If you don't wish to type in all the words in this listing, you can quit at any time, and the program will work

just as well. Just be sure that your last data statement is -999-.

If you examine the program, you may notice a few interesting items. For one thing, many CHAR and CIRCLE commands start with a comma. In line 70, for instance, you'll see CIRCLE,58,158,11,9. This is an accepted syntax. What I'm doing is leaving the first parameter unchanged. To leave it at its default value, you can either type the default or simply skip over it by entering a comma.

In line 20, however, you'll see COLOR,12. Why the period? Well, I wanted COLOR 0,12. BASIC interprets a period or decimal point as a 0, but it does it slightly faster than with the number itself.



HANGMAN 128

```
DB 10 REM COPYRIGHT 1991 COMPU
TE PUBLICATIONS INTL LTD
- ALL RIGHTS RESERVED
AG 20 COLOR4,14:COLOR,12:CLR:
PRINT "{6}{CLR}PLEASE WAI
T!":DIMB$(500):I=0
RB 30 READ B$(I):IF B$(I)="-99
9-" THEN N=I-1:Z=RND(-TI
):ELSE I=I+1:GOTO 30
HQ 40 IF I=0 THEN PRINT "{CLR}
{5 DOWN}":A$="NO WORD DA
TA YET!":FOR X=1 TO (20-
```

```
LEN(A$)/2):PRINT " ";NEX
T:PRINTAS:END
FS 50 E=:XR=E:COLOR1,11:GRAPH
IC1,1:Z=INT(RND(1)*(N+1
)):X=INT(RND(1)*50):IFX=.
THENFORL=250TO1STEP-2:CI
RCLE1,160,100,L,L,0,360,
L,90:NEXT
FG 60 IFX>1THENI=INT(RND(1)*25
0)+1:A=INT(RND(1)*359)+1
:R=INT(RND(1)*9)+2:V=INT
(RND(1)*15):DOUNTILXR>10
0:XR=XR+R:A=A+V:CIRCLE1,
160,100,XR,,,A,I:LOOP
PH 70 IFX=1THENBEGIN:CIRCLE,58
,158,11,9:CIRCLE,111,158
,11,9:CIRCLE,162,158,11,
9:DRAW,49,153TO180,60TO2
73,60TO151,154:DRAW,174,
160TO273,80TO273,60
FK 80 DRAW,70,160TO184,75TO234
,75TO123,160:DRAW,100,15
3TO184,90TO184,75:DRAW,1
84,90TO215,90:BEND
XB 90 COLOR1,16:Z$=B$(Z):CHAR,
0,0,"HANGMAN{8 SPACES}CO
MPUTE PUBLICATIONS 1991"
,l:A$=STR$(LEN(Z$))+ " LE
TTERS":CHAR,0,5,A$:FORA=
1TOLEN(Z$):CHAR,A-1,7,"*
":NEXT
JS 100 CHAR,0,23,"INCORRECT LE
TTERS USED":POKE208,.
BX 110 GETKEYAS:IFASC(A$)<65OR
ASC(A$)>90THEN110
GG 115 A=INSTR(B$(Z),A$):IFA=.
THENBEGIN:E=E+1:CHAR,AS
C(A$)-64,24,A$:ONEGOSUB
140,160,170,180,190,200
,210:IFE=8THEN220:ELSE1
0:BEND
SE 120 CHAR,A-1,7,A$:PRINT "{G
":MID$(Z$,A,1)="*":FORX
=1TOLEN(Z$):IFMID$(Z$,X
,1)<>"*"THEN130:ELSENEX
T:GOTO250
BE 130 A=INSTR(B$(Z),A$,A+1):I
FA=.THEN110:ELSE120
SF 140 COLOR1,1:FORA=3TO5:CHAR
,26,A," ",1:NEXT:CHAR,2
7,3,"{11 SPACES}",1:FOR
A=3TO18:CHAR,37,A," ",1
:NEXT
XK 145 CHAR,25,18,"{13 SPACES}
",1:V=32:FORA=18TO15STE
P-1:V=V+1:CHAR,V,A," ",
1:NEXT
RS 150 COLOR1,16:RETURN
DX 160 COLOR1,2:CHAR,25,6,"E
{SPACE}{*}" ,1:CHAR,25,7
,"{3 SPACES}",1:CHAR,25
,8,"{*}" ,1:CHAR,26,8,"
",1:COLOR1,16:RETURN
PF 170 COLOR1,13:CHAR,26,9," "
,1:FORA=10TO12:CHAR,25,
A,"{3 SPACES}",1:NEXT:C
```


PROGRAMS

BS 180 OLOR1,16:RETURN
COLOR1,13:FORA=.TO2:CHA
R,22+A,8+A," ",1:NEXT:C
OLOR1,16:RETURN

ES 190 COLOR1,13:FORA=.TO2:CHA
R,28+A,10-A," ",1:NEXT:
COLOR1,16:RETURN

EP 200 COLOR1,5:CHAR,25,13,"
{3 SPACES}",1:FORA=14TO
16:CHAR,27,A," ",1:NEXT
:FORA=.TO2:CHAR,25-A,14
+A," ",1:NEXT:COLOR1,16
:RETURN

DA 210 COLOR1,13:CHAR,27,17,"
{2 SPACES}",1:CHAR,22,1
6," ",1:CHAR,23,17," ",
1:COLOR1,16:CHAR,0,3,"T
HIS IS YOUR LAST CHANCE
!",1:RETURN

MM 220 CHAR,0,19,"IT WAS "+BS(
Z),1:Q=Q+1:CHAR,10,20,"
TOO BAD - YOU DIED!!",1
:CHAR,11,21,"PLAY AGAIN,
{2 SPACES}(Y/N)?:POKE2
08,..:COLOR1,15:CHAR,19,
4,"CHOKE!!

JJ 230 GETKEYAS:IFAS<>"Y"ANDAS
<>"N"THEN230

PD 235 IFAS="Y"THEN50:ELSEGRAP
HICCLR:PRINT"[CLR]YOU W
ON"W"AND I WON"Q:PRINT"
SO THAT MAKES ";:IFQ>WT
HENPRINT"ME";:ELSEIFW>Q
THENPRINT"YOU";

SB 240 IFQ=WHENPRINT"IT A TIE
!":NEW:ELSEPRINT" THE W
INNER!"NEW

EM 250 W=W+1:CHAR,13,20,"YOU A
RE FREE!!",1:CHAR,11,21
,"PLAY AGAIN{2 SPACES}(Y
/N)?:POKE208,..:GOTO23
0

PA 260 DATAEXAMPLE,CHAIR,HIPPO
POTAMUS,ELEPHANT,TABLE,
SOFT,STICK,DESK,POSTER,
SHIRT,PANTS,HOSE,GRAPPL
E,SHORT,SMART,SCOUT,CHI
LDREN,CHEEK,GOOD,COUCH,
TOYS,NOVEL,CHURN

DQ 270 DATANOZZLE,ZEBRA,CHUNK,
SLOW,SLIP,REST,WRETCH,O
CTET,ODDS,INSIDE,HAND,H
OOK,HOKED,PIPE,HOPE,FA
T,FREE,FLASH,FLANK,FLAM
E,FLARE,COIN,BLANK,META
L,INSANE,FLOWER

GQ 280 DATABASEACH,COURT,BASKET,
BEAM,DATA,AWFUL,AWOKE,S
PEAK,AXIS,BABY,KNACK,NO
TCH,NOTE,PARENT,ROCKET,
SKATE,STRIKE,NECK,ROMAN
,RODENT,ROGUE,ROCK,MUTA
NT,TRAUMA,TRAVEL

RC 290 DATATRAPEZE,TREAD,TRAY,
TRAWL,TRAIL,CIVIL,UNCIV
IL,ETHICAL,DOUBT,UNDER,
ATTACK,SUSTAIN,DECAY,RE
LEASE,UNDO,WEATHER,WEEK
,WHALE,WHACK,WENCH,CELL
,WEPT,YOUR,YACHT

GJ 300 DATALOCAL,TOURIST,LOADE
D,SAVED,INTERIOR,EXTERI
OR,HIGHER,LOWER,HIMSELF
,YODEL,DOUBLE,NOTHING,S

CROLL,NUMBER,ADDRESS,VE
RTICAL,HORIZONTAL,SUPPL
Y,PARTS,WALL,MEN

SP 310 DATADESTROY,DEEPER,LABE
L,EXAMINE,INTERACTIVE,D
ISK,TAPE,OPTIONS,MENU,F
ILE,REPEAT,MESSAGE,INVE
RSE,PORTION,PERSON,PERS
IAN,POUND,SCALE,SPACE,W
ASTE,FIELD

RR 320 DATAAUTOMATIC,MANLY,COW
BOY,MANIAC,LEPER,CARDIA
C,TALK,NEVER,DREAMED,DR
ESSED,STRONG,WEAK,WARNI
NG,WOMAN,OPENED,EDGE,EX
ISTENCE,LAUGH,HAPPEN,DA
NCED,SPEEDING

DB 330 DATAIMAGINE,ENEMY,SAINT
S,TELEVISION,DRILL,HOUS
E,MANSION,HOMESTEAD,HUT
,SHED,BOX,DESTRUCTION,M
ORE,ROME,HAIR,GIRL,FOOD
,PHONE,FARM,SHOT,HOUSE,
GRASS,DATE,YOUNG

DM 340 DATATIE,THEATER,WATCH,V
IEW,FOUND,POND,POUND,HO
RSE,RADIO,DOOM,PAPER,NE
WS,DEATH,KILL,CLASS,BUR
N,HANDS,FEET,PRIZE,EDIT
,PEEK,CHROMOSOME,DECOMP
RESSION,NUMERICAL

QM 350 DATASECURITY,APPRECIATI
ON,NUMERATE,HORIZONTAL,
ENTERPRISE,REGISTRATION
,CONVENTIONAL,BOOMERANG
,RIFLE,SPRAY,TORCH,FIRE
,MATCH,TILT,WILT,AMPLE,
REALM

DC 360 DATAMOUSE,APPLE,JUICE,H
OUSE,BANANA,POEM,VERSE,
ROYAL,TURN,NORTH,SPINNI
NG,SOUTH,WEST,EAST,UP,D
OWN,COMPASS,PRINCE,KING
,QUEEN,PRINCESS,SHRED,C
ORNER,UNICORN

QX 370 DATASQUARE,CLIMATE,PARA
GRAPH,ROSTER,RATIO,SOLI
D,ISOLATE,TRIPOD,HYMN,B
UTTON,PIGLET,COW,RAKE,S
HOVEL,HOE,SPADE,BRANCH,
TOUCH,SMASH,LAWN,FEASIB
LE,MINUTE

SM 380 DATACOMMA,CLUB,COMPRESS
,REPLENISH,MINE,DIRT,CA
R,COMPUTER,RISE,DAMP,SE
COND,HOUR,FALL,SINK,DRY
,WARM,DILUTE,SYSTEM,TER
MINATE,MAP,BICYCLE,PUZZ
LE,RULER,BOUGH

AC 390 DATAJUDGE,MUSIC,HOSPITA
L,VIOLIN,FILE,CASSETTE,
AXIOM,BOOK,SUPERMARKET,
REWARD,COVER,GRAPH,LINE
,CIRCLE,SPIRAL,HANGMAN,
ENCYCLOPEDIA,DICTIONARY
,VERBOSE,AMUSE

CF 400 DATADRAW,RECORD,DISK,CO
MPACT,CUSTOMER,STATEMEN
T,BANK,WITHDRAWAL,DEPOS
IT,INTEREST,COMMAND,VER
SION,KEY,LOCK,RHYTHM,OP
EN,CLOSE,ORGANIZATION,F
ORMAT,STRUCTURE

XH 410 DATAWINDOW,MAP,COUNTRY,

WORLD,GLOBE,PRESS,FOLLO
W,STEPS,LADDER,BENCH,TA
BLE,WIDTH,PEN,LIGHT,DAR
KNESSE,RESERVED,WORD,SEN
TENCE,PARAGRAPH,STORY,S
HORT,TALL,LONG

MQ 420 DATAAPPENDIX,LIVER,TYPE
WRITER,ARTIST,AUTHOR,SE
RIAL,AUTOMOTIVE,INDUSTR
Y,TROUGH,TOUGH,BOAT,WRE
CKED,CRAshed,SMASHED,BA
SHED,BLUDGEONED,HIT,HUR
T,BANGED

MJ 430 DATARETURN,ENTER,SHIFT,
LOCK,RUN,STOP,CONTROL,D
ISPLAY,RESTORE,CLEAR,DE
LETE,INSERT,CAPITAL,COM
PLETE,ILLUSTRATED,EDITI
ON,PERSONAL,PRIVATE,CAP
TAIN,MASSIVE

EG 440 DATALARGE,HEATER,COOLER
,TECHNICAL,GIFTED,RESEA
RCH,GREAT,SOFT,HARD,EAS
Y,GROUP,ULTIMATE,BEST,G
REATEST,ATTENTION,CHANG
ING,PERFECT,ELEMENT,ANI
MATION,ROBOT

GJ 450 DATAACCUMULATE,REGISTER
,INDEX,LOGARITHM,TRIGON
OMETRY,ABSEIL

BF 460 DATA -999-

ONLY ON DISK

There's something new on the *Gazette Disk*. In addition to the type-in programs found in every issue of the magazine, we're putting more features and programs on the *Gazette Disk* each month. Often, these programs would be too large for readers to type in. Check out the original 64 and 128 artwork on display in "Gazette Gallery," and look for our bonus programs as well. These programs and their instructions appear only on disk. Here's a description of this month's bonus program.

Typing Tutor

David M. Williams

This useful tutorial for the 128 in 80-column mode is designed to help you improve your typing speed and accuracy. Try to type the sentences exactly as they are presented; a bell will alert you if you've made a mistake. Select from a variety of difficulty levels. The program also rates your typing speed.



PROGRAMS

ROBERT C. TRAIN

What is the nature of the universe? We've all wondered about how we got here and what our purpose is. Is everything chaotic, or is there order in the universe?

Answers have been suggested by both science and religion, so don't expect your 64 or 128 to answer these for you. Whatever your particular preference, however, the recent theory of chaos suggests some interesting possibilities. Public television's critically acclaimed TV series "NOVA" recently ran a program about this theory and how it affects modern thought.

One of the more intriguing ideas presented on the program was that order and organization can be produced out of chaos by the repetition of a simple but constant rule. The implication is that our present universe may have arisen out of nothingness as a result of a few simple rules.

So far, our best scientific information to date indicates that our universe consists of chemical elements, each of which has certain properties predisposing it to behavior of one kind or another. Iron, for example, has an affinity or fondness for oxygen. Other elements have similar characteristics. At the beginning of our present universe, some rules prevailed over others, producing what we now know as the world around us.

About the Program

To illustrate the above point, take a plain sheet of paper and place six dots on it anywhere you like. For best results, place them near the four edges of the paper. Then roll a die twice to select any two of the points. Place a ruler between them, and halfway between them draw another point. From that point roll a die to select any other point and repeat the process. Continue this for about 24 hours. What emerges is phenomenal to behold.

If you don't want to spend all that time drawing lines to illustrate this point, there is another way. Let your computer do the work for you.

Typing It In

Chaos is written entirely in BASIC for the 128. (There's also a version for the 64.) To help avoid typing errors, enter the program with *The Automatic Proofreader* (see "Typing Aids" elsewhere in this section).

CHAOS

ORDER COMES OUT
OF CHAOS IN THESE
AMUSING
PROGRAMS FOR THE
128 AND 64

For my program, I've set up the graphic screen on the 128 and then implemented the above procedure except I've used only three dots. The loop (lines 100-270) identifies the endpoints of a line, interpolates half the distance between them, and then draws a dot. As the program repeats, patterns will emerge from the seemingly random dots.

Feel free to experiment further by changing the number of dots or the position at which the dot is placed along the line.

This simple program demonstrates that order can come from a seemingly chaotic sequence. Now if I could just figure out a way to pick the correct six lottery numbers. . .

CHAOS 128

```
DB 10 REM COPYRIGHT 1991 COMPU
TE PUBLICATIONS INTL LTD
- ALL RIGHTS RESERVED
RE 30 COLOR0,1
KK 40 POKE 53280,0
EJ 50 AX=1:AY=1:BX=319:BY=1:CY
=160:CY=199
EJ 80 COLOR1,2
JX 90 GRAPHIC1,1
BG 91 X=INT((RND(TI)*319)+1)
```

```
PR 92 Y=INT((RND(TI)*199)+1)
CK 100 FORI=1TO10000
SR 110 DRAW1,AX,AY:DRAW1,BX,BY
FB 130 DRAW1,CX,CY
MB 140 IFI>1THENX=KX
BE 150 IFI>1THENY=KY
HH 160 P=INT((RND(TI)*6)+1)
QB 190 IF P=1THENDX=AX:DY=AY
RB 200 IF P=2THENDX=AX:DY=AY
DQ 210 IF P=3THENDX=BX:DY=BY
XS 220 IF P=4THENDX=BX:DY=BY
RM 230 IF P=6THENDX=CY:DY=CY
PB 240 KX=(DX+X)/2:KY=(DY+Y)/2
HF 260 DRAW1,KX,KY
QX 265 IF I=10000THENEND
JH 270 NEXT I
```

CHAOS 64

```
KH 0 REM COPYRIGHT 1991 COMPUT
E PUBLICATIONS INTL LTD -
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PB 100 POKE 53280,0:POKE 53281
,0
SS 110 PRINT"{CLR}{8}{4 DOWN}"
:A$="CLEARING THE BITMA
P...":A=LEN(A$)
JQ 120 FOR X=1 TO 20-A/2:PRINT
" ";NEXT:PRINTAS
QC 130 FOR X=8192 TO 16192:POK
E X,0:NEXT
GA 140 AX=1:AY=1:BX=319:BY=1:C
X=160:CY=199
JM 150 POKE 53265,(PEEK(53265)
OR 32)
CC 160 POKE 53270,((PEEK(53270
) AND 223) OR 16)
CC 170 POKE 53272,((PEEK(53272
) AND 240) OR 8)
RE 180 PRINT"{CLR}":FOR X=1024
TO 2024:POKE X,255:NEX
T
FH 190 X=INT((RND(TI)*319)+1)
QS 200 Y=INT((RND(TI)*199)+1)
BS 210 FORI=1TO10000
QP 220 P1=AX:P2=AY:GOSUB360:P1
=BX:P2=BY:GOSUB360
EH 230 P1=AX:P2=AY:GOSUB360
FJ 240 IFI>1THENX=KX
QS 250 IFI>1THENY=KY
QJ 260 P=INT((RND(TI)*6)+1)
BR 270 IF P=1THENDX=AX:DY=AY
RX 280 IF P=2THENDX=AX:DY=AY
DM 290 IF P=3THENDX=BX:DY=BY
AM 300 IF P=4THENDX=BX:DY=BY
XH 310 IF P=6THENDX=CY:DY=CY
JQ 320 KX=(DX+X)/2:KY=(DY+Y)/2
JA 330 P1=KX:P2=KY:GOSUB360
ED 340 IF I=10000THENEND
PQ 350 NEXT I
AQ 360 BT=8192+INT(P2/8)*320+I
NT(P1/8)*8+(P2 AND 7)
SF 370 POKE BT,PEEK(BT) OR 2*(
7-(P1 AND 7))
HS 380 RETURN
```


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How to Type In COMPUTE's Gazette Programs

Each month, Gazette publishes programs for the Commodore 128 and 64. Each program is clearly marked by title and version. Be sure to type in the correct version for your machine. All 64 programs run on the 128 in 64 mode. Be sure to read the instructions in the corresponding article. This can save time and eliminate any questions which might arise after you begin typing.

We regularly publish two programs designed to make typing easier: *The Automatic Proofreader*, for BASIC programs, and *MLX*, for entering machine language programs.

When entering a BASIC program, be especially careful with DATA statements, as they are extremely sensitive to errors. A mistyped number in a DATA statement can cause your machine to "lock up" (you'll have no control over the computer). If this happens, the only recourse is to turn your computer off and then on, erasing what was in memory. This could cause you to lose valuable data, so be sure to *save a program before you run it*. If your computer crashes, you can always reload the program and look for the error.

Special Characters

Most of the programs listed in each issue contain special control characters. To facilitate typing in any programs from Gazette, use the following listing conventions.

The most common type of control characters in our listings appear as words within braces: {DOWN} means to press the cursor-down key; {5 SPACES} means to press the space bar five times.

To indicate that a key should be shifted (hold down the Shift key while pressing another key), the character is underlined. For example, A means hold down the Shift key and press A. You may see strange characters on your screen, but that's to be expected. If you find a number followed by an underlined key enclosed in braces (for example, {8 A}), type the key as many times as indicated (in our example, enter eight shifted A's).

If a key is enclosed in special brackets, [A], hold down the Commodore key (at the lower left corner of the keyboard) and press the indicated character.

Rarely, you'll see a single letter of the alphabet enclosed in braces. This can be entered on the Commodore 64 by pressing the Ctrl key while typing the letter in braces. For example, {A} means to press Ctrl-A.

The Quote Mode

You can move the cursor around the screen with the Crsr keys, but you may want to move it under program control, as in examples like {LEFT} and {HOME} in the listings. The only way the computer can tell the difference between direct and programmed cursor control is the quote mode.

Once you press the quote key, you're in quote mode, which can be confusing if you mistype a character and cursor left to change it. You'll see a graphics symbol for cursor left. Use the delete key to back up and edit the line. Type another quotation mark to get out of quote mode. If things get too confusing, exit quote mode by pressing Return; then cursor up to the mistyped line and fix it. If the mistake involves cursor movement, you must press the quote key to reenter quote mode. □

When You Read:	Press:	See:
{CLR}	SHIFT CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT ↑ CRSR ↓	
{DOWN}	↑ CRSR ↓	
{LEFT}	SHIFT ← CRSR →	
{RIGHT}	← CRSR →	
{RVS}	CTRL 9	
{OFF}	CTRL 0	
{BLK}	CTRL 1	
{WHT}	CTRL 2	
{RED}	CTRL 3	
{CYN}	CTRL 4	

When You Read:	Press:	See:
{PUR}	CTRL 5	
{GRN}	CTRL 6	
{BLU}	CTRL 7	
{YEL}	CTRL 8	
{F1}	f1	
{F2}	SHIFT f1	
{F3}	f3	
{F4}	SHIFT f3	
{F5}	f5	
{F6}	SHIFT f5	
{F7}	f7	
{F8}	SHIFT f7	

When You Read:	Press:	See:
←	←	
↑	SHIFT ↑	

For Commodore 64 Only

[1]	COMMODORE	1	
[2]	COMMODORE	2	
[3]	COMMODORE	3	
[4]	COMMODORE	4	
[5]	COMMODORE	5	
[6]	COMMODORE	6	
[7]	COMMODORE	7	
[8]	COMMODORE	8	

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THE AUTOMATIC PROOFREADER

P H I L I P I. N E L S O N

The Automatic Proofreader helps you type in program listings for the 128 and 64 and prevents nearly every kind of typing mistake.

Type in the *Proofreader* exactly as listed. Because the program can't check itself, type carefully to avoid mistakes. Don't omit any lines, even if they contain unusual commands. After you've finished, save a copy before running it.

Next, type RUN and press Return. When the program displays the message *Proofreader Active*, you're ready to type in a BASIC program.

Every time you finish typing a line and press Return, the *Proofreader* displays a two-letter checksum in the upper left corner of the screen. Compare this result with the two-letter checksum printed to the left of the line in the program listing. If the letters match, it's almost certain the line was typed correctly. If not, check for your mistake and correct the line.

When using the *Proofreader* with another utility, disable both programs before running a BASIC program.

```
0 CLR
10 VE=PEEK(772)+256*PEEK(77
3):LO=43:HI=44:PRINT"
{CLR}{WHT}AUTOMATIC PROO
FREADER FOR ";
20 IF VE=42364 THEN PRINT "
64"
30 IF VE=17165 THEN LO=45:H
I=46:WAIT CLR:PRINT"128"
40 SA=(PEEK(LO)+256*PEEK(HI
))+6:FOR J=SA TO SA+166:
READ B:POKE J,B:CH=CH+B:
NEXT
50 IF CH<>20570 THEN PRINT
{SPACE}"*ERROR* CHECK TY
PING IN DATA STATEMENTS"
:END
60 FOR J=1 TO 5:READ RF,LF,
HF:RS=SA+RF:HB=INT(RS/25
6):LB=RS-(256*HB)
70 CH=CH+RF+LF+HF:POKE SA+L
F,LB:POKE SA+HF,HB:NEXT
80 IF CH<>22054 THEN PRINT
{SPACE}"*ERROR* RELOAD P
ROGRAM AND CHECK FINAL L
INE":END
90 IF VE=17165 THEN POKE SA
+14,22:POKE SA+18,23:POK
ESA+29,224:POKESA+139,224
100 POKE SA+149,PEEK(772):P
OKE SA+150,PEEK(773):PR
INT"{CLR}PROOFREADER AC
TIVE"
110 SYS SA:POKE HI,PEEK(HI)
+1:POKE (PEEK(LO)+256*P
EEK(HI))-1,0:NEW
```

```
120 DATA120,169,73,141,4,3,
169,3,141,5,3,88,96,165
,20,133,167
130 DATA165,21,133,168,169,
0,141,0,255,162,31,181,
199,157,227
140 DATA3,202,16,248,169,19
,32,210,255,169,18,32,2
10,255,160
150 DATA0,132,180,132,176,1
36,230,180,200,185,0,2,
240,46,201
160 DATA34,208,8,72,165,176
,73,255,133,176,104,72,
201,32,208
170 DATA7,165,176,208,3,104
,208,226,104,166,180,24
,165,167
180 DATA121,0,2,133,167,165
,168,105,0,133,168,202,
208,239,240
190 DATA202,165,167,69,168,
72,41,15,168,185,211,3,
32,210,255
200 DATA104,74,74,74,74,168
,185,211,3,32,210,255,1
62,31,189
210 DATA227,3,149,199,202,1
6,248,169,146,32,210,25
5,76,86,137
220 DATA65,66,67,68,69,70,7
1,72,74,75,77,80,81,82,
83,88
230 DATA 13,2,7,167,31,32,1
51,116,117,151,128,129,
167,136,137
```

□

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